CARPENTER

The Carpenter Steel Co.
1101 Stock Yards Sta.
Chicago, Ill.

Tel. Haymarket 5086
5087

WORKS OF THE CARPENTER STEEL COMPANY

READING, PENNA.

THE CARPENTER STEEL COMPANY

Manufacturers of

High-Grade Steels and Wire

Hot-Rolled, Hammered, Cold-Rolled, Cold-Drawn

Forgings

Rough, Rough-Machined, Finish-Machined, Heat-Treated

General Office and Works
READING, PA.

Copyright, 1914, by
The Carpenter Steel Company
Reading, Pa.

GENERAL CATALOG

"D"

Pulling-out a pot of molten steel from the crucible melting-furnace

GENERAL OFFICES
WORKS AND WAREHOUSE

Reading, Pa.

BRANCH WAREHOUSES
CARRYING COMPLETE STOCKS

Cleveland, Ohio.....400 Lakeside Avenue, N. W.
Chicago, Ill.....1101 West Lake Street
Hartford, Conn.....410 New Park Avenue

SALES REPRESENTATIVES

Charles A. Heil, District Sales Manager
F. W. Curtis
Cleveland, Ohio.....400 Lakeside Avenue, N. W.
John B. Guthrie, District Sales Manager
Chicago, Ill.....1101 West Lake Street
C. W. Olsen, District Sales Manager
Hartford, Conn.....410 New Park Avenue
F. C. Phillips
Detroit, Mich.....2900 West Grand Boulevard
H. J. Joyce, Jr.
Indianapolis, Ind.....3646 Coliseum Avenue
W. O. Steele
New York, N. Y..... 100 Broadway
H. B. Gaylord
Philadelphia, Pa.....Bulletin Building
J. M. Millard
Providence, R. I.....224 California Avenue
James A. Nolan
Rochester, N. Y.....327 University Avenue

LONG DISTANCE BELL TELEPHONE
PRIVATE BRANCH EXCHANGE

WESTERN UNION TELEGRAPHIC CODE
PRIVATE CODE ON APPLICATION

CODE ADDRESS, CARPSTEEL

CONTENTS

Warehouses and Agencies	3
Introduction	9
General Information	20
Carpenter Tool-Steels, Regular Grades	23
Zenith and Star-Zenith High-Speed Tool-Steels	25
Instructions for working High-Speed Steels	28
High-Speed Steel for Tool-Holders and Cutting-off Tools	30
Air-Hardening Tool-Steel	32
Fast-Finishing Tool-Steel	33
Extra-Special Tool-Steel	35
Special Tool-Steel	35
Extra Tool-Steel	36
Standard Tool-Steel	36
Comet Tool-Steel	37
Titan Tool-Steel	37
Hardening of Straight-Carbon Tool-Steels	38
Carbon-Temper	38
Heat Colors	39
Hardening Heats	41
Carbon-Temper Numbers	46
Tempering	48
Carpenter Special-Service Alloy Tool-Steels	51
T-K Special Alloy-Steel	56
T-K Alloy-Steel	57
K-W Die Steel	58
Reading Double-Special Steel	58
Stentor (Unshrinking) Steel	59
Keystone Hot-Header Steel	59
Jason Roll-Steel	60
J-Y Alloy-Steel	60
Midas Steel	61
Presto Steel	61
Additional Special-Service Alloy Tool-Steels	62

Roll-Turning Steel 62
Veneer-Knife Steel 62
Chisel-Bit Steel 63
Drawing-Die Steel 63
Double-Extra Wire-Die Steel 63
Tool-Steel Classification 64
Die-Blocks 82
Die-Block Classification 83
Discs and Rings 84
Disc Classification 84
Ring Extras 85
Discs—Sizes and Prices 86
Sundry Cutting Steels 118
Cutlery Steel;—Classification 118
Axe and Hatchet Steel 119
Razor Steel 119
Lawn-mower Steel 119
Auger-Bit Steel 119
Coal-Auger Steel 119
File Steel;—Classification, Shapes and Sizes 120
Pivot Steel;—Classification 124
Spring Steels;—Classification 126
Machinery Steels 128
Crucible Machinery Steel;—Classification 129
Open-Hearth Machinery Steel;—Classification 130
Sundry Special Products 132
Norswede Ingot-Iron 132
Rifle-Barrel Steel 132
Permanent Magnet Steel 133
"Carsco" Magnet Steel 134
Paper-Machinery Steel 136
Facing Steel 136
Gun Steel 136
Cone Steel 136
Hammer Steel 136

Drill Steel 137
Roller Steel 137
Spindle Steel 137
Emery-Wheel Dresser Steel..... 137
Set-Screw Steel 137
Wedge Steel..... 137
Forgings;—Heat-Treatment 138
Rolls and Trunnion-Balls 141
Automobile Steels... 143
Miscellaneous Steels 144
Chrome-Nickel Steel Castings..... 145
Cold-Rolled and Cold-Drawn Steel Specialties.... 169
Cold-Rolled Strip-Steel;—How to Order..... 171
Cold-Rolled Strip-Steel and Flat Wire;—Price List 174
Safety-Razor Steel;—Price List..... 177
Cold-Drawn Bar Steel;—Price List..... 178
Wire Specialties 181
Round and Flat Wire;—Price Lists..... 181
Needle Wire;—Price List..... 183
Electrical Resistance Wire..... 184
Drill-Rods;—Price List..... 186
Tables and Useful Information..... 209
Weight of Steel..... 210
Weight of Bar-Steel..... 211
Weight of Flat-Rolled Bar-Steel 217
Weight of Discs 223
Weight of Cold-Rolled Strip-Steel..... 224
Wire Gauges..... 231
Fractions of One Inch in Decimal Equivalents, 234
Thermometer Scale..... 235
Temperatures Fahrenheit and Centigrade..... 236
Metric Conversion Factors..... 237
Millimeter Fractions in Decimals of an Inch .. 238
Useful Rules. 239
Index..... 249

Running a pot of molten steel from the melting-furnace to the mixing-ladle

TO THE PRACTICAL USER OF OUR TOOL STEEL

IRON AND STEEL—In the form of iron-ore iron occurs in nature combined with oxygen and associated usually with small quantities of silica, manganese, sulphur and phosphorus. By mixing the ore with charcoal and heating it with gentle blast in a low furnace that is scarcely more than an open fire, the oxygen separates from the iron and the metal is obtained. This simple procedure, called the direct process, was the earliest way of extracting iron from its ore, and in some parts of the old world it may still be found in actual operation. In most localities, however, the high cost of fuel and labor for the small output of metal obtained by this primitive process has led to its abandonment in favor of the indirect but nevertheless more economical method, which consists of a combination of the familiar blast-furnace and puddling processes.

In the first of these, ore and fuel and limestone flux are charged into the top of a tall furnace and air is blown in near the bottom. During the gradual descent of the ore through the hot furnace, the iron becomes completely separated from the oxygen with which it was united; then it melts and combines with about three per cent. of its weight of carbon and with smaller proportions of silicon and other elements that are present, and finally it is tapped as pig-iron from the bottom of the furnace. By simple remelting, this material can be used at once for making iron castings; but when the purer malleable metal is required, either to form the wrought-iron of commerce or to serve as raw material for making crucible-steel, it becomes necessary to boil and stir the pig-

iron in a puddling furnace, thereby burning away, so far as possible, all the carbon and other foreign elements, in order to get the practically pure metal.

Whether obtained by the old-fashioned direct process or by the later combination of the blast-furnace and puddling processes, in either case the iron is taken from the furnace as a pasty mass or ball which, while still hot, is hammered or pressed into billet form and then is rolled or further hammered into bars.

For the manufacture of crucible-steel these iron bars are generally cut up into small pieces and melted in clay or graphite crucibles with an accurately weighed amount of charcoal, steel scrap and alloys. The melted material is cast into ingots and these are rolled or hammered into bars and die-blocks which are known to the trade as crucible tool-steel.

GRADES—The "grade" or quality of the crucible-steel depends, to a very important degree, upon the quality of the iron bars that enter so largely into its composition; and, in turn, the quality of the iron depends upon the skill and care by which harmful elements, like phosphorus and sulphur, were removed, so far as possible, in the process of its production; and above all upon the purity of the ore from which, in the first place, it was derived. A few thousandths of one per cent., more or less, of phosphorus or sulphur in the iron affect tremendously the esteem in which it is held for steel-making purposes, and naturally this is reflected in the price of the material, which ranges all the way from $35.00 to $120.00 a ton—the higher prices being obtained for well-established brands of iron of the highest purity. With so great a variation in the price of the iron from which the steel is made, it is easy to see why

the cost of manufacture and the price of crucible-steel should also vary between wide limits; for the higher its grade, the purer and finer and more costly must be the brand of iron used as the base, and the larger also must be the proportion of it entering into the product.

The highest grades of crucible-steel are used for tools in which great endurance under severe working conditions is required, or for tools like cutters and dies, in which the labor-cost of fashioning them is large compared with the cost of the steel itself. On the other hand the lower and less expensive grades answer well enough where the work is not so hard on the tool; but even so, it is rarely true economy to buy the cheapest grade. The cost of a tool is made up of three items:

1. Cost of the steel in the bar.
2. Cost of making the tool.
3. Cost of keeping the tool in working order.

Of these, the third item depends on the endurance of the tool, and taken in connection with the rate at which the tool can work, determines very largely the economy of its use to reduce the per-piece cost of machined articles through fewer interruptions for regrinding. Wear and the cost of redressing and regrinding, besides the liability to crack in hardening, are all less for tools made of high-grade, than of low-grade, steel, and these advantages usually more than offset the initial saving in low first cost of an inferior grade.

Manufacturers of tool-steel customarily distinguish their different grades by names chosen arbitrarily. In themselves these names mean nothing, but they acquire a valuable significance in the mind of the steel-user who becomes familiar with the steel of a

given make and given grade-name. The names of our regular grades of Carpenter tool-steel, with the distinguishing characteristics of each, will be found on pages 26 to 37.

CARBON—By far the most useful element that combines with the iron in the melting-pot to form steel is carbon. In connection with different percentages of silicon, manganese, nickel, chromium, tungsten, vanadium, etc., it imparts to the steel the valuable properties of hardness, strength and toughness in varied proportions, adapting it to meet the almost infinite variety of requirements demanded of tools and parts made from crucible-steel. When none of these elements but silicon and manganese occur with the carbon in the steel, and then only in small proportions, usually below one per cent., it is customary to speak of the metal as "carbon-steel" or "straight-carbon steel," but when one or more of the other elements are present, and especially in larger proportions, considerably in excess of one per cent., the metal is called an "alloy-steel." These distinguishing terms have come more and more into fashion since the advent of high-speed tool-steel, which generally contains large percentages of chromium and tungsten, and also since the extensive introduction of nickel and chrome-nickel steels in modern automobile construction. Of our ten regular grades of tool-steel, the first four are alloy-steels, while the last six are carbon-steels, as enumerated on page 23.

Each grade of straight-carbon tool-steel is usually made up in several different carbon-classes, distinguished from one another by containing different proportions of carbon, ranging all the way from 30 to 250 points — a "point" denoting one one-hundredth of one per cent. (0.01%) of the weight of the steel.

The purpose of this wide range is to enable the manufacturer to supply, for any given use, tool-steel of the particular carbon-content that has been found by experience most suitable for that use. According to its carbon-content, or "carbon-temper," as it is also called, the steel is given a distinguishing letter, or number, in addition to its grade-name. Our carbon-temper numbers, and the corresponding carbon-contents of our steels in common use, are as follows:

Temper No.	Carbon Content		Temper No.	Carbon Content	
	Per Cent.	Points		Per Cent.	Points
3	.26 to .35	26 to 35	10	.96 to 1.05	96 to 105
4	.36 " .45	36 " 45	11	1.06 " 1.15	106 " 115
5	.46 " .55	46 " 55	12	1.16 " 1.25	116 " 125
6	.56 " .65	56 " 65	13	1.26 " 1.35	126 " 135
7	.66 " .75	66 " 75	14	1.36 " 1.45	136 " 145
8	.76 " .85	76 " 85	15	1.46 " 1.55	146 " 155
9	.86 " .95	86 " 95	16	1.56 " 1.65	156 " 165

(See pages 46 and 47.)

For special purposes, requiring unusual exactness in the carbon-content of the steel, we divide, or split, any given temper-number into "high" and "low," so that we can furnish at slight extra charge any grade of our tool-steel with a maximum variation in carbon not to exceed five, instead of the customary ten, points.

In the selection of carbon-tempers it is well to bear in mind that as a general rule, and within limitations determined by practice, the higher the percentage of carbon in the steel, the greater will be the working efficiency of the tool made from it. But it is equally as important to remember that with the

higher carbon, the steel becomes more sensitive to heat-treatment, and, therefore, that all the more care will have to be bestowed upon the forging, hardening and tempering. For example, Carpenter EXTRA, No. 12 temper (containing 120 points of carbon), will make an excellent lathe-tool for taking light finishing-cuts on metal surfaces; but better results will be obtained by using the same grade in No. 13 temper (130 points of carbon), provided the tool in latter case is forged, hardened and tempered with all the care and skill demanded by the more sensitive, or "tenderer" nature of the higher-carbon steel. Still better results, we may add, will be attained if the tool is made not only of steel with the higher carbon, but also of the next higher grade, or Carpenter SPECIAL, No. 13 temper—which merely confirms the well-known rule of practice that in selecting tool-steel for a given purpose it is nearly always advisable to go up in grade as the carbon is raised. The purposes for which each grade of Carpenter tool-steel is particularly recommended will be found by referring to pages 46 and 47.

Carbon-temper, it is almost superfluous to remark, must be clearly distinguished from the blacksmith's use of the word "temper" to denote the peculiar condition of moderated hardness that is produced by quenching a piece of steel from a high heat and then "tempering" or partly softening it to reduce brittleness and toughen the metal, as will be more fully considered presently.

FORGING—Success in making tools depends upon the skill and experience of the tool-maker, the suitability of his heating-appliances for forging, hardening and tempering, and the grade and carbon of the steel he uses. To heat for forging, some large estab-

lishments use oil- or gas-fired muffle-furnaces in which the temperature can be easily and closely controlled. Generally, however, the blacksmith's forge has to be depended upon for the heating, and too much attention cannot be given by the tool-maker to securing a good uniform heat—yet one that is no higher than is absolutely necessary for the work. A clean fire is essential, with plenty of fuel between the steel and the blast-nozzle to protect the corners of the piece from the blast. Slow heating is also important; or, at least, the heating should take place no faster than the heat can be driven uniformly through the piece without over-heating the edges. The higher the carbon in the steel, the greater will have to be the care to avoid overheating or "burning." In good practice the blacksmith does not heat the tool back on the shank any further than is absolutely necessary to do the forging—especially when he is working with an air-hardening or high-speed alloy-steel. As soon as the piece has reached a uniform forging heat, it should be withdrawn from the fire. "Soaking," or allowing the steel to remain in the fire after it is properly heated through, is always objectionable; no practice will more surely make the steel "dry" and brittle.

Forging to shape is best done rapidly; and in the case of straight-carbon steels, just as the parts intended for the cutting-edges drop to a blood-red heat, they should be worked with light, quick hammer-blows to refine the grain until all color disappears. After forging, it is always advantageous to reheat the piece slowly and uniformly to a low cherry-red, and then allow it to cool very gradually to remove all forging strains.

HARDENING—In hardening, the greatest possible care is required to secure the best results. Every detail is essential: nothing is unimportant. As a double precaution in the case of valuable dies, especially if the shapes are intricate, an extra anneal is given before hardening to remove the effect of cold hobbing, etc. For heating, where an oil- or gas-fired muffle is not available, the tool or die is first warmed in the outer, or cooler, zone of the forge fire; then by turning it over toward the hotter zone, it is slowly and uniformly heated with gentle blast and with plenty of fuel between it and the blast-nozzle, until the required hardening temperature is reached. For straight-carbon steels this will lie between 1375 and 1500 degrees Fahrenheit—cherry and full bright cherry—the former for high-carbon steels, and the latter for low-carbon steels.*

As soon as the tool has attained the proper hardening temperature it should be withdrawn from the fire, with care to avoid undue exposure to the air, and should be promptly dipped on a rising heat and kept immersed with constant stirring in the bath until cold. As a quenching medium, water of a temperature of 68 to 80 degrees Fahrenheit is recommended, and will generally harden sufficiently; but if extreme hardness is required, salt brine or other hardening solutions may be used. The more violent the cooling the harder will be the steel.

* On page 39 will be found a scale of colors representing as nearly as may be the full range of heats from faint red to white, with the corresponding temperatures in degrees Fahrenheit and Centigrade, and a descriptive name for each. There is no universally accepted rule or practice about the use of these heat-names for actual temperatures—at best they are rough approximations. We claim no special merit for the scale shown, but hope that its consistent use throughout this catalog will serve a convenient purpose to the user of our steel, when working in the moderate diffused daylight of the average blacksmith-shop.

Although every bar of tool-steel is marked with its grade and carbon-temper, a careful tool-maker, who does not happen to be familiar with the particular steel he is about to use, will first test his bar by forging a piece down to ½ inch square and then nicking it in about half-a-dozen places at one end, at distances ½ inch to 1 inch apart. Then he will heat the nicked end in such a way as to allow the first, or end-section to become white hot and the other sections to grade through the various shades of yellow and cherry to a low red heat. Noting with an experienced eye the heat-color of each nick, and keeping it in mind, he will quickly quench the steel and break it at the several nicks. The fracture at the first nick (in the case of a carbon-steel) will usually show a very coarse, open, crystalline texture and bright luster, characteristic of "burned" steel. The next fracture will also appear coarse-grained and crystalline, but to a less pronounced degree than the first. The third fracture will be of a closer grain than the first or second, while the fourth is very likely to possess a perfectly even and very close, velvety grain with a rich blue-gray luster, indicative of the proper condition of the steel for the purpose of a cutting-tool. By repeating his experiment with but a single nicked specimen, heated as nearly as possible to the temperature indicated as the correct one in the previous test, the tool-maker will determine, beyond a doubt, the hardening temperature which will thoroughly refine the grain of the steel and make it most suitable for his purpose.

TEMPERING—After hardening, the tool may easily resist the action of a file but the hardened portion will be comparatively weak and brittle, and if put to use in this condition, the cutting-edge will

wear away rapidly. The practical steel-worker long since found a remedy for this evil by reheating the hardened portion of the tool to a very moderate temperature, the effect being to toughen the steel considerably at the cost of only a slight loss in hardness. The most durable of edge-tools is the one which is just hard enough to do its work, all excess of hardness with its attendant brittleness having been first removed by this reheating, or "drawing the temper." The trained eye of a good tool-maker estimates with remarkable accuracy the desired degree of reheating by the tint or tarnish of oxide-of-iron that forms during the reheating on the previously brightened surface of the hardened piece. In ordinary carbon-steel this tarnish-color ranges from faint yellow through straw, brown and violet to dark blue. (For the tarnish-colors and corresponding temperatures see page 48.) The lighter the tint, the less has been the reheating, and the harder, therefore, does the steel remain. Among the many methods of effecting this reheating to draw the temper of the steel, by far the best one consists in carefully heating the cutting-edge over a light dry fire or on a piece of red-hot iron until the proper tarnish-tint or color is observed, and then immersing the tool to prevent any further rise in temperature, or in blacksmith's phrase to "set the grain."

ANNEALING—Crucible-steel that has been well worked under the hammer or in the rolls is usually too hard to be readily machined without first being annealed or softened. When, therefore, machining is necessary to cut the steel into intricate shapes for tools and dies, it must first be annealed, and this is accomplished by heating the steel slowly and very uniformly to a cherry, about 1350 to 1375 degrees

Fahrenheit, followed by a uniform, slow cooling. While the cooling may take place in a dying-out furnace, the steel must never be allowed to "soak" for any length of time in the full annealing heat to which it was raised. As this is always injurious to it, the safer practice is to withdraw the piece from the furnace as soon as it has reached the proper annealing temperature and allow it to cool slowly in any non-conductor of heat, such as coal, ashes, lime or mica. To avoid forming a heavy scale of oxide of iron, the heating is done to best advantage in a closed box, pipe or muffle, without direct contact of the flame or access of air. With proper attention in this respect, the annealed steel will have a fairly clean surface, and if the heat has been kept down sufficiently, the piece, when cold, will still show the thin blue scale that was put there in the hammering or rolling. But even with the utmost care it is impossible to avoid a slight lowering of the carbon-content on the surface of the annealed piece. The decarbonization takes place to a depth of 1/16 to 1/8 inch, and amounts to 10 or 15 points of carbon, and sometimes considerably more. In every case where the finished article, such as a die or cutter, is to be hardened, this partially decarbonized skin should be planed or turned off before the steel is machined to finished shape or size, and sufficient stock must be allowed for this purpose when the steel is ordered. Failure to observe the simple precaution of removing the skin will usually result in insufficient, uneven and spotty hardening.

GENERAL INFORMATION

TERMS

Terms are net cash in 30 days, unless otherwise specially agreed.

QUOTATIONS

All quotations are for immediate acceptance and prices are subject to change without notice.

SALES

Orders and contracts of sale are accepted subject to the provision that strikes, fires, accidents and other causes of delay beyond our control, shall relieve us from prompt fulfillment thereof.

SHIPMENTS

We make delivery f. o. b. cars at our works. If a freight allowance is made on tool-steel, it applies only on lots of 300 pounds or more, to points east of the Mississippi River.

Shipments by express will be made only at customer's request and expense, or whenever the weight is less than the railroad will accept as freight.

EXTRAS

Extra charges will be made in accordance with the classifications in this catalog. Boxing, casing and barreling at cost.

PAYMENTS

Checks and drafts should be drawn to the order of The Carpenter Steel Company and forwarded to the Treasurer at Reading, Pa.

WARRANTY

We will replace any steel which, if properly selected and used, shall prove defective, but we will not allow claims for labor or damage.

HOW TO ORDER TOOL-STEEL

When ordering always specify:

(1) The grade,
(2) The size,
(3) The carbon-temper, or
(4) The purpose for which the steel will be used.

This is particularly important when the steel is to be made into costly tools or dies.

If you specify the grade and purpose for which the tool-steel will be used, but omit to specify the carbon-temper, we will send the temper which we last sent you for the same purpose; or if we have not shipped you any steel for that purpose, we will ship the temper which in our judgment appears best suited for the work.

If bars are to be machined, order at least ¼ inch larger than the finished size.

When ordering die-blocks, whether forged or cut from the bar, state (1) the length, (2) the width, (3) the thickness, allowing ⅜ inch over all, each way, for machining.

Bars run 6 to 12 feet long according to weight. We reserve the right to make up a full bar of two pieces, unless otherwise specially ordered. Bars of unusual length will be made to order at a small extra charge.

LABELS

Labels like those shown in reduced size in this catalog are placed upon all our grades of tool-steel, and our name and the grade and temper-number (see page 46) are stamped in every bar.

SPECIAL NOTICE

The railroads charge extra for hauling lengths over 22 feet unless there is sufficient weight at regular rates to make more revenue than the following minimums, which they demand:

Official	Classification—1000	lbs.	at	first	class	rate
Southern	Classification—4000	"	"	"	"	"
Western	Classification—5000	"	"	"	"	"

If our prices cover delivery, freight allowance is made by us on actual weight at the regular Iron and Steel rate only.

CARPENTER TOOL-STEELS

REGULAR GRADES

ALLOY-STEELS

STAR-ZENITH, HIGH-SPEED;

ZENITH, HIGH-SPEED;

AIR-HARDENING, SEMI-HIGH-SPEED;

FAST-FINISHING.

CARBON-STEELS

EXTRA-SPECIAL, STANDARD,

SPECIAL, COMET,

EXTRA, TITAN.

THE CARBON-STEELS ARE FURNISHED IN A NUMBER OF CARBON-TEMPERS TO SUIT THE WORK.

See Pages 46 and 47.

For Special-Service Alloy Tool-Steel Grades, See Pages 51-63.

NOTE

Fracture, as a guide for estimating carbon in tool-steel, is useful chiefly to the melter, while the steel is in ingot form and before any work has been done upon it; but even for ingots it furnishes at best an approximate rather than an exact guide. **(See page 34.)** **In bar-steel the appearance of the fractured surface can be so profoundly modified by the manner of heating and hammering, and especially by the temperature at which the work is finished, that it cannot serve to estimate the carbon-temper.**

CARPENTER
HIGH-SPEED TOOL-STEELS

STAR-ZENITH **ZENITH**

As compared with straight-carbon tool-steel all high-speed steels are poor conductors of heat, and in proportion to the increase of their cutting powers the temperature-range within which they can be worked grows narrower. For this reason high-speed steels must be very slowly and carefully heated until the color shows, and in forging they require more repeated heatings than the older steels. Bearing these general precautions in mind, the working of high-speed tool-steels should give rise to no exceptional difficulties.

The special field of these steels lies in machining metals at cutting-speeds that were undreamt of a few years ago, the aim of each steel-maker being to excel all others in the capacity and endurance of tools made of his particular brands of high-speed steel. To achieve a high degree of excellence, not once or exceptionally for a special or phenomenal test, but regularly and uniformly, day by day, The Carpenter Steel Company uses only the purest and choicest materials in the production of its STAR-ZENITH and ZENITH brands of high-speed steel and exercises the closest care in every detail of their manufacture. Uniformity, therefore, can be positively guaranteed, and every assurance of satisfaction given to the user.

All sizes in Chicago Stock

CARPENTER STAR-ZENITH HIGH-SPEED TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

This latest development of our well-known and deservedly popular Zenith brand of High-Speed Tool-Steel meets the most severe and exacting demands of high-duty machine-tools of up-to-date design. It is equally well adapted for roughing and finishing cuts, and is unexcelled for machining the dense and exceedingly tough alloy-steels that enter so largely into the construction of motor-cars and many machine-parts of modern design.

For forged tools, such as tools for lathes, planers, shapers and boring-mills, and for a great variety of shaped tools like milling-cutters, twist-drills, taps and reamers, this steel stands in the very forefront, appealing alike to the tool-designer, tool-maker and tool-user through its remarkable uniformity, ease of handling and unexcelled efficiency.

Where the equipment of a machine-shop is not sufficiently powerful to benefit by the full cutting capacity of STAR-ZENITH Steel, its use will still be found economical on account of the very long periods for which STAR-ZENITH tools can be run at normal cuts and speeds without having to stop for regrinding. Every user of automatic machinery will appreciate the full measure of this advantage.

Furnished annealed or unannealed in bars, blocks and discs; also in hardened lengths for tool-holders.

For handling and treating instructions, see page 28.

CARPENTER ZENITH HIGH-SPEED TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

For extremely heavy cutting, where a very strong high-speed steel is required, and for certain shop conditions where the machine-tools are not of the most modern design and the work is intermittent, this well-established grade is still a prime favorite.

ZENITH steel is second only in high-speed cutting qualities to our STAR-ZENITH steel, and is maintained at the same high degree of excellence and uniformity that won for it its early fame.

For high-speed cutting-tools of all kinds, and for inserted saw-teeth, wood-working knives and special dies it continues to fill a wide sphere of usefulness.

For handling and treating instructions, see page 28.

INSTRUCTIONS FOR WORKING

CARPENTER HIGH-SPEED TOOL-STEELS

STAR-ZENITH ZENITH

Cutting—To cut a piece from a cold bar, saw clear through the bar; never nick and break. To cut with a chisel, first heat the bar to a lemon and then cut clear through.

1—FOR LATHE AND PLANER TOOLS

Forging—Warm the steel to remove any chill, especially in winter. Then heat slowly and carefully to a point where the steel moves freely under the hammer—that is, until it is heated uniformly throughout to a lemon or light-yellow heat (1830° to 2000° Fahr.), and start to forge. Stop forging when temperature drops to dark orange or a free scaling-heat (about 1600° to 1630° Fahr.). Reheat as often as necessary to shape the tool, and after forging allow the tool to cool before treating, but avoid placing it on damp ground or in a draft of air.

The heating for forging should be done preferably in a pipe or muffle-furnace, but if this is not practicable, keep a good bed of clean fire between the blast-pipe and the tool. Never allow the piece to soak after the desired forging-heat has been reached. Do not heat the steel further back than is necessary to shape the tool, yet sufficiently far to avoid doing any work upon the shank below a bright cherry heat. Dress the back of a lathe-tool perfectly flat, to provide proper support in the tool-post close to the head.

Hardening—Slowly reheat the cutting-edge of the tool to a clear cherry (about 1400° Fahr.); then force the blast and so raise the temperature quickly to a full white heat (2200° to 2300° Fahr.). Cool the point of the tool in an air-blast or preferably in thin oil—if dipped, keep the tool stirring in the oil.

To remove hardening strains, reheat the tool while still warm to just under visible red (700° to 750° Fahr.), preferably in a bath of lead or nitre (saltpeter), or else heat very slowly over the fire until the temper-color is drawn well beyond a blue.

Grinding—Grind tools to remove all scale. A free-cutting dry emery-wheel is preferred; but if ground wet, use plenty of water. In either case use very light pressure so as not to draw the color, as this almost invariably checks the tool. Avoid blueing the cutting-edge.

2—For Milling-Cutters and Other Shaped Tools

Annealing—Place the steel in an air-tight box, pipe or muffle, arranged so as to allow at least an inch of packing of coke-dust, powdered charcoal or mica between the pieces and the walls of the box or pipe.

Heat slowly and uniformly to a full cherry-red (1400° to 1420° Fahr.) and hold the steel at this temperature until the heat has passed thoroughly through the metal; then cool very slowly in a dying-out furnace, or in hot ashes or lime. The slower the cooling, the softer the steel will be.

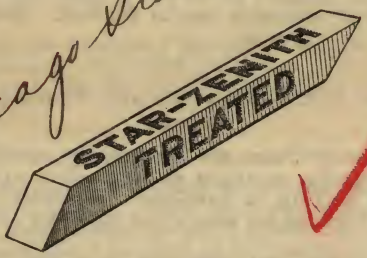
The heating requires from two to ten hours, depending on the size of the piece.

To anneal a 1-inch square piece of high-speed steel according to these directions, requires, for the complete operation, from ten to twelve hours, after which the steel will be found as soft as annealed carbon tool-steel.

Hardening and Tempering—For these operations it is desirable to have two furnaces—one that can be held at a cherry-red (about 1375° to 1400° Fahr.), and the other at a white heat (2200° Fahr.). Reheat the tool in the low-temperature furnace and when it attains the full heat of this furnace transfer it quickly to the high-temperature furnace. Keep the tool in the high-temperature furnace only long enough to reach the temperature of this furnace. Then remove and quench in oil, or in a dry air-blast if the shape of the tool makes this preferable.

Draw in oil at 500° to 550° Fahr., allowing the tool to remain in the bath at this temperature at least thirty minutes or until heated all through to this temperature.

CARPENTER STAR-ZENITH TOOL-HOLDER STEEL



Cut to standard tool-holder lengths with 30-degree angle ends. Each piece is hardened, ready to be ground and put to work.

Furnished from stock in 5-pound and 10-pound boxes; one size or assorted sizes in a box.

Price, ~~$5.00~~ and ~~$10.00~~ per box.

STANDARD LENGTHS, READY TO SHIP

¼	inch	square,	2½	inches	long
5/16	"	"	2½	"	"
⅜	"	"	3	"	"
7/16	"	"	3½	"	"
½	"	"	4	"	"
⅝	"	"	4½	"	"
¾	"	"	5	"	"

We also carry in 24-inch lengths, for tool-holders, a large assortment of treated squares and flats up to 1 square inch in section.

Price per pound, base sizes.....

Extras for size, cutting to length, etc., on pages 64-65.

Extra for treating.....5 cents per lb.

DIRECTIONS FOR TREATED BARS

Do not heat to cut, but nick the bar on all four sides upon an emery-wheel; then break cold to desired length and grind to shape on a dry wheel.

BEVELLED HIGH-SPEED STEEL
FOR CUTTING-OFF TOOLS

This steel is rolled with double-bevelled sides to fit in box tool-holders. Its form adapts it for making very efficient and economical cutting-off and facing tools.

Furnished either annealed or unannealed in bars, or hardened in 18-inch lengths.

SIZES CARRIED IN STOCK

1¾	inch	x	5/16	inch	and	¼	inch
1½	"	x	5/16	"	"	¼	"
1¼	"	x	¼	"	"	3/16	"
1¼	"	x	3/16	"	"	⅛	"
1	"	x	¼	"	"	3/16	"
1	"	x	3/16	"	"	⅛	"
1	"	x	⅛	"	"	3/32	"
⅞	"	x	3/16	"	"	⅛	"
⅞	"	x	⅛	"	"	3/32	"
¾	"	x	⅛	"	"	3/32	"
⅝	"	x	⅛	"	"	3/32	"

Price per pound.....Base

Size is determined by the width and narrowest thickness.

Extra for shape, 10 per cent. above base.

Extras for size, annealing, cutting, etc., on pages 64-65.

Extra for hardening .....5 cents per pound

DIRECTIONS FOR HARDENED BARS

Do not heat to cut, but nick the bar on all four sides upon an emery-wheel; then break cold to desired length and grind to shape on a dry wheel.

CARPENTER AIR-HARDENING TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

For turning and boring tools, wherever extremely hard cutting is required in machines not fitted for working ZENITH steels to their full capacity.

Specially recommended for high-speed wood-working knives for which it is furnished in hard bars, ready for grinding.

DIRECTIONS FOR WORKING

For forging, heat slowly and thoroughly to a lemon and shape the tool. Then cool and re-heat the cutting-edge to a low lemon, 1800° Fahr., and place in a cold blast until quite cold.

The hardness of the cutting-edge can be regulated according to the work, by exposing the tool at a higher or lower heat to the cold blast.

Do not attempt to punch or cut this steel cold, but heat slowly to a bright cherry and nick all around while hot.

For annealing, follow same directions as for annealing ZENITH High-Speed Steel, page 29.

CARPENTER FAST-FINISHING TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

A semi-high-speed steel for finishing-tools of all kinds, intended to produce the highest machine-finish required on metal surfaces. Especially valuable for milling-cutters, rifling-tools, burnishing-tools, etc., and for cutting all kinds of brass.

DIRECTIONS FOR WORKING

Forging. **First warm to remove any chill, especially in winter; then heat very slowly and uniformly to a bright cherry or salmon and forge the tool with light blows. Never forge below a bright cherry heat.**

Treating. **Re-heat slowly, thoroughly and uniformly to bright cherry, 1400° to 1450° Fahr., or even to a salmon, and dip in tepid water, 80° to 90° Fahr. Keep the tool constantly in motion while in the water.**

For tools having a good backing, the temper need not be drawn. For tools of delicate construction and milling-cutters, draw the temper to between faint yellow and straw-yellow to suit the requirements.

Annealing. **Follow same directions as for annealing ZENITH High-Speed Steel, page 29.**

CARPENTER
CARBON TOOL-STEELS

In the manufacture of crucible tool-steel, the molten metal is customarily poured or teemed from each individual pot (or, at most, from a few pots together) into a separate ingot-mold, and the carbon-content of every ingot is estimated by fracture.

In marked contrast to this prevailing practice of teeming and grading single-pot ingots, all Carpenter crucible-steel is made by teeming the metal from many pots into a large ladle where it is thoroughly mixed before casting. Manifestly the ingots of a given heat, or melt, cast from well mixed ladle-metal, will run far more uniform in carbon and other elements than ingots of the same heat if obtained by the old-fashioned method of single-teeming.

Besides this greater inherent uniformity of Carpenter ladle-cast crucible-steel, its carbon-content is closely and accurately determined by chemical analysis—every laboratory determination being invariably checked in duplicate. The superiority of this practice over the old-time estimation of the carbon by fracture is so obvious that we can guarantee with perfect confidence the carbon-content of every bar of crucible-steel we make.

Though all grades of our carbon and alloy tool-steels are now cast from a ladle, the practice was begun with our straight-carbon steels, described in the following pages. In view of the importance of a uniform, reliable and definitely known carbon-content in the several carbon-tempers of these steels, it is well to realize, just here, that they are all made from ladle-cast ingots.

CARPENTER EXTRA-SPECIAL TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

The highest grade of straight-carbon tempering steel that can be made. Used for extraordinary requirements, such as the finest dies and tools, where the first cost of the steel is the least important factor.

CARPENTER SPECIAL TOOL-STEEL

Always in Chicago Stock

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

For lathe and planer finishing-tools, taps, dies, punches, reamers, milling-cutters, shear-blades, roll-corrugating and wood-working tools and all purposes where a carbon-steel of very high quality, uniformity, great strength and endurance is desired. Furnished in different carbon-tempers to meet requirements.

Chicago Stock

CARPENTER EXTRA TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

For lathe and planer tools, taps, dies, reamers, drills, shear-blades, wood-knives, cutlery and all purposes requiring a choice steel that combines hardness with toughness to a marked degree. Can be hardened to an unusual depth and is therefore highly recommended for all-around shop-work. Furnished in different carbon-tempers to meet requirements.

CARPENTER STANDARD TOOL-STEEL

Price, per pound, base sizes .....

Extras for size, annealing, etc., on pages 64 and 65.

A steel for all ordinary purposes, such as granite-tools, cold-chisels and hot-dies; also an excellent steel for smiths' tools, rivet-sets, boiler-shop tools and rock-drills, requiring a selected grade of straight-carbon crucible metal.

Rounds in Chicago Stock

CARPENTER COMET TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

For all purposes requiring a uniform and reliable, yet comparatively inexpensive, grade of steel. This includes axe- and hatchet-steel and a wide range of quarry, smith, track and boiler-shop tools and drills.

Guaranteed strictly Crucible Cast Steel and furnished in all carbon-tempers.

CARPENTER TITAN TOOL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

Made from good stock and in all carbon-tempers. Widely known and used for mining and quarry drills, oil-well bit and jar steel, coal-cutting tools and track-sets and all the varied requirements of jobbers. Unexcelled for the price.

HARDENING OF CARPENTER STRAIGHT-CARBON TOOL-STEELS

The proper hardening of our EXTRA-SPECIAL, SPECIAL, EXTRA, STANDARD, COMET and TITAN grades will depend in each case on the carbon-temper supplied, as more fully set forth below.

CARBON-TEMPER

As explained on page 13 the carbon-temper of tool-steel means the proportion of carbon it contains, expressed in "points" or hundredths of one per cent. The temper-marks used by different steel-makers designate arbitrarily the "points" of carbon in their steels: for the convenience of our customers we have for many years used for this purpose numbers in a rising scale, the lowest number denoting the mildest steel—that is, steel of the lowest carbon-content.

On pages 46 and 47 will be found the temper-numbers of our straight-carbon grades of tool-steel and the uses to which the steel bearing those numbers is best adapted.

The temper-number is distinctly noted upon the label on every bar of carbon-steel and is also stamped into both ends and the middle of the bar itself.

The hardening-heats given for each carbon-temper have been determined with the greatest care, in the manner explained on page 42, and may be safely relied upon to yield the most satisfactory results.

Heat Colors

In Moderate Diffused Daylight, with Approximate Temperatures

Names *	Color Scale	Cent.	Fahr.
White		1200°	2200°
Light Yellow		1080°	1975°
Lemon		1000°	1830°
Orange		940°	1725°
Dark Orange †		890°	1630°
Salmon ‡		840°	1550°
Bright Cherry		790°	1450°
Cherry		745°	1375°
Medium Cherry		690°	1275°
Dark Cherry		635°	1175°
Blood Red		580°	1075°
Faint Red		500°	930°

* SEE FOOT-NOTE, PAGE 16. ‡ SCALING HEAT.

† FREE SCALING HEAT.

FOR COMPARISON OF FAHRENHEIT AND CENTIGRADE SCALES, SEE PAGES 235 AND 236.

Hardening Heats

How the Proper Hardening Temperatures of Carpenter Tool-Steels are Determined

When a piece of tool-steel is heated for hardening, an experienced and observant tool-dresser will note a perceptible lag or retardation in the rising temperature of the piece, just before the proper hardening heat is reached. In our laboratory this lag-point is accurately determined with a very delicate instrument which automatically traces, upon paper or glass, an ascending and nearly straight line that is usually called the "heating-curve" of the steel.

Figure 1 on this page shows such a line or "heating-curve" for a piece of tool-steel containing .90 per cent. carbon. The prominent jog, beginning at 1350° Fahr., represents the lag or "critical-point," as it is usually called, for the heating of this particular steel. Ex-

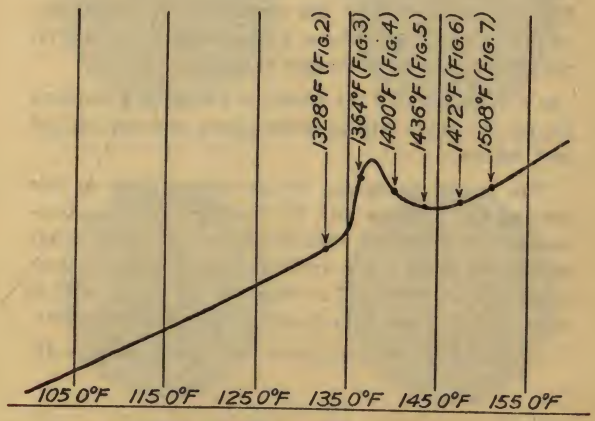


Fig. 1. Heating-Curve for .90-Carbon Tool-Steel.

perience teaches that for proper hardening the steel must be heated slightly beyond this point. Just how far beyond will depend on the size and section of the piece, but any great excess of heat will injure the steel.

Besides determining the critical-point in the heating-curve of each different grade and carbon-temper of tool-steel, after the manner shown in Figure 1, page 41, we parallel this work by studying the structure of the same steel when quenched from temperatures at and about the critical-point. Figures 2 to 7, page 43 illustrate the structure of a .90 per cent. carbon tool-steel, magnified 550 diameters, quenched in water from temperatures marked Nos. 2 to 7 on the heating-curve, Figure 1, page 41. The proper hardened structure for this steel is shown in Figure 5. Figure 2 shows the result of an attempt to harden from a temperature below the critical-point, while Figures 3 and 4 show the structural conditions obtained by quenching above, yet not sufficiently above, the critical-point, for proper hardening.

In Figures 6 and 7 the effects are seen of quenching too far above the critical-point, where overheating has just begun.

The proper hardening temperatures given in this catalog on pages 46 and 47 for the various carbon-tempers of Carpenter tool-steels have all been determined by finding the critical-point in the heating-curve of each steel and by checking the result in each case with a photo-micrograph of the steel-structure.

For drawing the temper after hardening, see page 48.

PHOTO-MICROGRAPHS OF .90 PER CENT. CARBON TOOL-STEEL, MAGNIFIED 550 DIAMETERS

Fig. 2. Quenched at 1328° F. Too low for proper hardening.

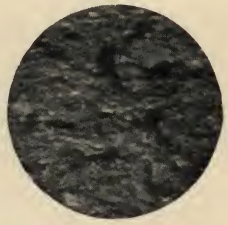


Fig. 3. Quenched at 1364° F. Slight underheating.

Fig. 4. Quenched at 1400° F. Very slight underheating.

Fig. 5. Quenched at 1436° F. Proper structure.

Fig. 6. Quenched at 1472° F. Very slight overheating.

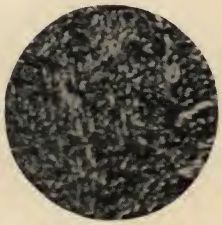


Fig. 7. Quenched at 1508° F. Slight overheating.

NOTE

Straight-carbon grades of Carpenter tool-steel harden when quenched at temperatures between 1375 and 1500 degrees Fahr., according to the carbon-content, as given on pages 46 and 47.

Alloy-grades of Carpenter tool-steel harden when quenched at temperatures between 1400 and 2300 degrees Fahr. or over, according to the grade, as referred to on pages 28-29 and 53-63.

CARPENTER

CARBON-TEMPER NUMBERS AND CORRESPONDING HARDENING-HEATS

5 For track-bolt dies used for hot work, where water is continually run on the dies; crank-pins, and machinery parts which must combine slight hardness with great toughness.

Hardens very slightly at a full bright cherry heat; approximately 1500° Fahr.

6 For hot work generally; hot drop-forging bolt and rivet headers, hot sets, smith-shop tools, flatters, fullers, wedges, set-screws, etc.

Hardens at a full bright cherry heat; approximately 1480° Fahr.

7 For track-tools, smith-shop tools, rivet-sets, cupping tools, hot drop-forging dies and many other purposes.

Hardens at a bright cherry heat; approximately 1470° Fahr.

8 For large shear-knives, punches, chisels, hammers, sledges, cold-sets, track-chisels, forging-dies, hammer-dies, boiler-makers' tools, well-drills and numberless other tools and purposes.

Hardens at a bright cherry heat; approximately 1455° Fahr.

9 For punches, large cutting and trimming dies, drop-dies for cold work, mining-drills, small shear-knives, hand-chisels and an endless variety of other purposes.

Hardens at just under a bright cherry heat; approximately 1440° Fahr.

10 For taps and reamers, mining-drills, channeling drills, cups and cones, springs, large milling-cutters, punches, axes, etc.

Hardens at just under a bright cherry heat; approximately 1430° Fahr.

11 For milling-cutters, taps, trimming-dies, reamers, saw-swages, circular cutters of all descriptions, mill-picks, wood-working and forming tools, threading-dies and a variety of other purposes.

Hardens at below a bright cherry heat; approximately 1420° Fahr.

12 For small taps, trimming- and cutting-dies, threading-dies, circular cutters, forming- and boring-tools; also for twist-drills, screw-dies, ball-races, peen-hammers, granite-points, drawing-dies, mandrels, edge-tools generally, razors and many other purposes.

Hardens at a clear but not a bright cherry heat; approximately 1400° Fahr.

13 For lathe, planer and slotter tools, generally; brass-working tools, drawing-dies, razors and tools requiring great hardness.

Hardens at a good cherry heat; approximately 1385° Fahr.

14 For roll-corrugating and chilled-roll turning-tools, graver-tools and a great variety of other fine tools when carefully handled.

Hardens at a cherry heat; approximately 1380° F.

15-16 For tools requiring extreme hardness, such as for roll-corrugating and chilled-roll turning.

Hardens at a cherry heat; approximately 1375° F.

TEMPERING

On pages 46 and 47 will be found the temper-numbers in which our bath-hardening brands, namely, TITAN, COMET, STANDARD, EXTRA, SPECIAL and EXTRA-SPECIAL are furnished, together with the temperatures, in degrees Fahrenheit, at which steels of the several temper-numbers harden.

That the hardened tools must be "let down" or "drawn" to impart the necessary toughness to the steel has been fully explained on page 17. Drawing temperatures and corresponding tarnish-tints, or so-called temper-colors, are given on the opposite page. According to the purpose for which the hardened tools are intended, they should be drawn as there indicated, with this reservation, however, that our recommendations are not to be regarded as absolute, but only as a guide to the tool-maker for determining by individual experiment the particular temper best adapted to the work in hand.

The temperature figures should be used only in working with an oil-tempering furnace or a muffle-furnace, and a high-temperature thermometer. They afford a sufficient basis for any user of steel to find a temperature for "letting down" or "drawing" which will give the best results for his work. When once this proper temperature is determined and when it is accurately controlled with a high-temperature thermometer, it can be relied upon to yield uniform results, so long as steel of the same carbon-temper is used.

TEMPER-COLORS

	Fahr.
FAINT YELLOW (or Light Yellow)	435°

For tools of great cutting power when used for cutting hard metals at very slow speed.

PURE YELLOW (or Full Yellow)	450°

For lathe and planer finishing-tools, milling-cutters, large taps and reamers, plane-irons, twist-drills, thread-cutting tools, etc.

STRAW (Straw Yellow)	475°

For stay-bolt taps, small cutting-tools subjected to hard usage, thread-cutting tools, etc.

DEEP STRAW (Brown Yellow)	500°

For various punches and dies, stone-drills, mill-picks, file-cutters, etc.

PEACOCK (Purple Red)	525°

For shear-knives, punches, hot- and cold-chisels, rivet-sets, hammers, mauls, cold-sets, track-tools, boiler-makers' tools, etc.

VIOLET	550°

For smith-tools and battering tools generally, which with adequate hardness are to possess special toughness.

BLUE	575° to 625°

For springs, gears, surgical instruments, etc.

Teeming a crucible of molten steel into a mixing-ladle to insure uniformity of quality

CARPENTER
SPECIAL-SERVICE
ALLOY TOOL-STEELS

FOR HOT AND COLD WORK

The most progressive step yet taken in the development of tool-steels

FOR

Punches, Dies, Shear-Blades, Cups and Cones, Ball-Races, Roller-Paths, Rolls, etc., etc.,

when used under conditions where straight-carbon steel fails.

1114

CARPENTER
SPECIAL-SERVICE
ALLOY TOOL-STEELS

High-speed and semi high-speed cutting steels are the most familiar examples of alloy tool-steel. Like our ZENITH steel, they belong, as a rule, to the chrome-tungsten type, but many other and very different types have been successfully developed to meet unusual service conditions, more especially for tools operating by pressure and impact. For efficiency and performance in their particular lines of work these special-service alloy-steels cannot be approached by even the best grades of straight-carbon steel when proper care is exercised in the hardening and tempering.

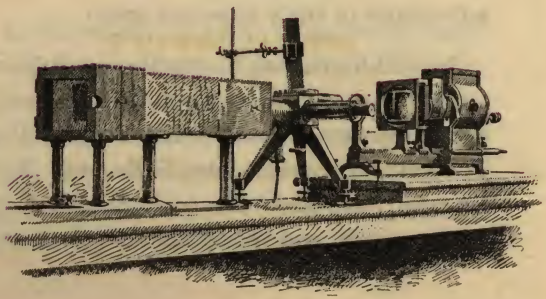
As the result of close attention devoted to this comparatively recent, but highly important, development in the manufacture of high-grade tool-steels, we have placed on the market a number of special-service alloy tool-steels, each designed to meet certain special or unique conditions, and

all thoroughly proved and tested for their particular work. Ten of the most important of these grades are given on pages 55 to 63.

For detailed hardening instructions the user is referred in most cases to our agents or our home office, not because the hardening is attended with any unusual difficulty, but because the most satisfactory results are usually obtained by applying to each individual case some slight modification of the general treatment. That our special hardening instructions are welcomed in many of the smith-shops and tool-rooms throughout the country, we have the most satisfactory assurance. By adapting those instructions to the conditions of each particular case, we aim to give the users of these steels the fullest advantage of their superior merit.

Special hardening instructions will therefore be given on application or will accompany shipments of all Special-Service Alloy Tool-Steels except our T-K and K-W brands, for which the general directions on pages 56 and 57 should be followed.

Taking a photo-micrograph of a section of Alloy Tool-Steel, magnified 1100 diameters, with a Le Chatelier apparatus



LEADING GRADES OF SPECIAL-SERVICE ALLOY TOOL-STEEL

T-K Special Alloy-Steel

T-K Alloy-Steel

K-W Die Steel

Reading Double-Special (R.D.S) Steel

Stentor (unshrinkable) Steel

Keystone Hot-Header Steel

Jason Steel, J-Y Alloy-Steel

Midas Steel, Presto Steel

SPECIAL-SERVICE ALLOY TOOL-STEELS

FOR

Roll-Turning Tools, Veneer-Knives

Chisel-Bits, Drawing-Dies

and Wortles

CARPENTER T-K SPECIAL ALLOY-STEEL

MOST EFFICIENT HIGH-DUTY TOOL-STEEL FOR ALL HOT WORK

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

Designed expressly for hot-gripping or holding dies. Possessing exceptional hardness and toughness while hot, this steel resists remarkably well the battering action of the header in the hot-heading of bolts and rivets.

Furnished either soft-annealed, to be tempered by user, or preferably heat-treated to a definite hardness, for use without further tempering,

For hot-heading die-work it excels straight-carbon steel of SPECIAL quality as much as high-speed steel excels straight-carbon water-tempering steels for lathe-work.

***Treating*—Heat the tool slowly and evenly to a light orange (1750° to 1800° Fahr.) and cool in air, allowing a free circulation around it. For bars, a free circulation of air may make the steel too hard and therefore the air-cooling is preferably done in a box or pipe. Draw the temper to suit.**

***Annealing*—Follow directions for High-Speed Steel, page 29.**

CARPENTER T-K ALLOY-STEEL

FOR HOT WORK

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

Used for hot-gripping dies where the work is not severe enough to require T-K SPECIAL, and used also with conspicuous success for hot-shears, hot-punches, etc.

The characteristic property of this steel—toughness at low red heat—adapts it peculiarly for hot-heading work. While it requires care in heat-treatment, it does not check as readily as other high-duty hot-steels.

Furnished either soft-annealed, to be tempered by user, or preferably heat-treated to a definite hardness, for use without further tempering.

***Treating*—Heat the die, punch or shear slowly and evenly to a light orange (1750° to 1800° Fahr.) and cool in air, allowing a free circulation around it. For bars, air-cool preferably in a box or pipe or under cover.**

***Annealing*—Follow directions for High-Speed Steel, page 29.**

CARPENTER K-W DIE STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

A high-duty water-hardening alloy-steel particularly adapted for cold-punching, riveting and blanking dies; also for pneumatic-hammer pistons and for purposes requiring a very unusual combination of toughness and hardness.

Forge and harden the same as No. 10 temper straight-carbon steel, page 47.

READING DOUBLE-SPECIAL STEEL (R.D.S)

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

An oil-hardening, crucible chrome-nickel alloy die-steel supplied for both cold and hot punches and dies, where very hard or tough material is to be worked.

Hardening instructions, where required, accompany shipments. See page 53.

All sizes in Chicago Stock

CARPENTER STENTOR STEEL

Price per pound, base sizes .....

Extras for size, annealing, etc., on pages 64 and 65.

An oil-hardening alloy-steel which neither contracts nor expands in hardening. For master-taps and reamers, plug-gauges, intricate dies and wherever extreme accuracy after hardening is required.

Hardening instructions, where required, accompany shipments. See page 53.

CARPENTER KEYSTONE HOT-HEADER STEEL

Price per pound, base sizes.....

Extras for size, etc., on pages 64 and 65.

A treated alloy-steel for use as the striking- or heading-die in the process of hot-heading bolts, nuts, rivets, etc. The most effective steel ever made for this purpose. Used for the header where Carpenter T-K Steel is used for the gripping-die.

Furnished in bar-lengths, treated: no hardening of the finished dies will be required.

CARPENTER JASON ROLL-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

One of the most successful crucible alloy-steels for all kinds of hardened rolls, from the heavy rolls of cold-mills to highly polished jeweler's rolls; also for hardened balls, wrist-pins and parts subjected to great strain and wear.

Furnished in bars and forgings, and also machined, hardened and ground. Hardening instructions, where required, accompany shipments. See pages 53 and 141.

CARPENTER J-Y ALLOY-STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

The choicest grade of water-hardening alloy-steel for ball-races, roller-paths, etc. Absolute uniformity guaranteed. After exacting tests, this grade was adopted by the United States Government for these purposes and also for fulcrum and fulcrum-bearing plates on the heavy gun-mounts of battleships.

It also makes excellent thread-roller dies.

Hardening instructions, where required, accompany shipments. See page 53.

CARPENTER MIDAS STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

A very high grade of crucible chrome-steel that has been perfected for cups and cones to equal the best imported ball-race steel. It machines easily. When water-hardened it shows 101 Shore test.

Hardening instructions, where required, accompany shipments. See page 53.

CARPENTER PRESTO STEEL

Price per pound, base sizes.....

Extras for size, annealing, etc., on pages 64 and 65.

A very reliable crucible alloy-steel for cups and cones, second in quality only to our MIDAS steel, and far superior to any carbon tool-steel for this purpose. When water-hardened it shows 98-100 Shore test.

Hardening instructions, where required, accompany shipments. See page 53.

In a lower carbon-range this steel makes extraordinarily strong, resilient springs for motor-cars

ADDITIONAL
SPECIAL-SERVICE
ALLOY TOOL-STEELS

CARPENTER ROLL-TURNING STEEL

Price per pound, base sizes .....

Extras for size, annealing, etc., on pages 64 and 65.

Unsurpassed for turning and corrugating the hardest chilled cast-iron rolls. Preferred to any straight-carbon tool-steel by many roll-turners.

Forge like a high-carbon tool-steel and harden in tepid water from a full bright cherry (1500° Fahr.). Do not draw the temper.

CARPENTER VENEER-KNIFE STEEL

Price per pound, base sizes .....

Extras for size, annealing, etc., on pages 64 and 65.

A crucible alloy-steel of great toughness, used for making veneer-knives that require a very keen, durable cutting-edge.

Furnished in bars both soft and nature-hard, or in blades, either hard-forged or forged and machined, ready for grinding.

READING ALLOY CHISEL-BIT STEEL

Price per pound, annealed .....

The chromium in this steel makes it possible to impart to the bits or inserted teeth of circular wood-saws a very hard, keen edge without sacrificing toughness.

CARPENTER DRAWING-DIE STEEL

Price per pound, base sizes .....

Extras for size, annealing, etc., on pages 64 and 65.

This high-duty alloy die-steel is used for cold shape-work and heavy drawing, and wherever "hard" dies and severe service are required. Since in most cases the dies must be hardened before use, the uniform shrinkage of this steel is one of its most valuable properties.

Furnished in annealed bars and discs.

To harden, heat uniformly to a salmon (1540° to 1550° Fahr.) and flush cold water through the hole of the die. For sectional or built-up dies, this steel is often used without hardening.

READING DOUBLE-EXTRA WIRE-DIE OR WORTLE STEEL

Price per pound, base sizes .....

Extras for size, annealing, etc., on pages 64 and 65.

This choicest grade of alloy wire-die steel is used for wortles and for all cases where stock of small sizes is to be drawn through "soft" dies.

It is usually furnished in annealed bars, easy to drill and prick, and holds the size of the wortle-holes remarkably well, even in the drawing of the most refractory steels and other metals and alloys.

TOOL-STEEL CLASSIFICATION

APPLYING TO ALL GRADES OF TOOL-STEEL, ALL DIMENSIONS INCLUSIVE

Intermediate Sizes Take the Next Higher Extra

ROUND, SQUARE, OCTAGON AND HEXAGON

⅝ to 2 inches.....Base

Inches	Extra per lb., Cents
2⅛ to 3	1.0
3⅛ to 4	1.5
4⅛ to 5	2.0
5⅛ to 6	2.5
6⅛ to 7	3.0
7⅛ to 8	3.5
8⅛ to 9	4.0
9⅛ to 10	5.0

Inches	Extra per lb., Cents
9/16 to ½	0.5
7/16 to ⅜	1.0
5/16 and 11/32	2.0
¼ and 9/32	3.0
3/16	5.0
5/32	10.0
⅛	18.0

FLAT

⅝ to 2 inches thick x 9/16 to 2 inches wide.....Base

Inches	Extra per lb., Cents
⅛ x 3/16	20.0
⅛ x ¼	15.0
⅛ x 5/16	8.0
⅛ x ⅜	4.0
⅛ x 7/16 to ½	3.0
⅛ x 9/16 to 7	2.0
⅛ x 7⅛ to 8	3.0
3/16 x ¼	5.0
3/16 x 5/16	4.0
3/16 x ⅜	3.0
3/16 x 7/16 to ⅝	2.0
3/16 x 11/16 to 2	1.5
3/16 x 2⅛ to 7	1.0
3/16 x 7⅛ to 8	2.0
¼ x 5/16 to ⅜	2.0
¼ x 7/16 to ⅝	1.5
¼ x 11/16 to 2	1.5
¼ x 2⅛ to 7	1.0
¼ x 7⅛ to 8	2.0

Inches	Extra per lb., Cents
5/16 x ⅜ to ⅝	1.5
5/16 x 11/16 to 8	1.0
⅜ x 7/16 to 8	1.0
7/16 x ½ to 8	1.0
½ x 9/16 to 8	1.0
9/16 x 2⅛ to 8	1.0
⅝ to 2 x 2⅛ to 7	1.0
⅝ to 1¾ x 7⅛ to 8	1.0
1⅞ to 2 x 7⅛ to 8	1.5
2⅛ to 3 x 2⅛ to 5	1.0
2⅛ to 3 x 5⅛ to 8	1.5
3⅛ to 4 x 3⅛ to 6	1.5
3⅛ to 4 x 6⅛ to 8	2.0
4⅛ to 5 x 4⅛ to 7	2.0
4⅛ to 5 x 7⅛ to 8	2.5
5⅛ to 6 x 5⅛ to 8	2.5
6⅛ to 7 x 6⅛ to 7	3.0
6⅛ to 8 x 7⅛ to 8	3.5

Continued

income tax 1944

Tobacco	$967.00
2 Months Milk	227.65
Pigs	50.00

4 months Work at Plant 6
Edgerton Sand Gravel Co.
Edgerton Farmers Elev. Co.

Etta for 1944

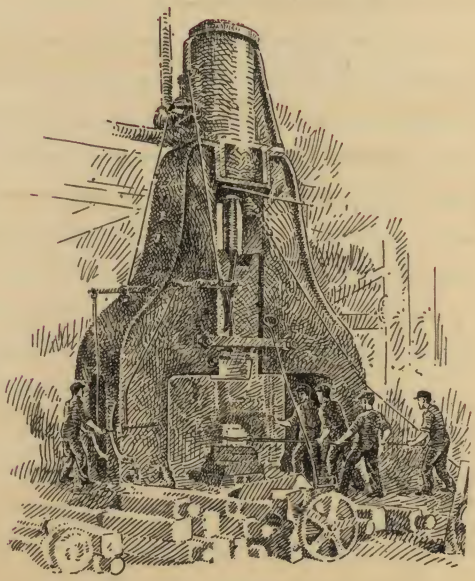
Work	70.00
Help	100.00
Board for two months	40.00
Lights & Gas	14.00
Dr. & Hospital	112.65
Gas for tractor	30.00
Veterinarian	15.00

Mrs A. Walter
7335 S Coles
Chicago N 9
Ill.

Mrs Harry E Elliott West Fulton st Edgerton
Olly Marlyn
Mary Hans
Grandma Allen
Oscar Lenore Hippe
Sanford Hildegarde Hippe
Oscar Myrtle Amundson
Aunt Elsie Simonson
Leo Isabell
Glenn Burke
George Devina
Chester
Lila Kritz
Al Gwen Walters
Erma
Sophie Tom Maney
Hank Edythe
Robert Charlotte Hippe
Elmer Tan Olson
Helen Emery
Charles Lorraine
Edwin Blanche

Doris Marsden
Edwin Quam
Arlette Westby
Stanley Popek
Albert Tilly
Sam Edith
Meta Fred
Yorman Mafs
Lars Norma Everest Lowell
Harry Olga Shannon
Olin Florence
John E Wenzel
Grace Bill

A 15,000 pound steam-hammer for shaping a crucible steel die-block



CARPENTER

DIE-BLOCKS, DISCS AND RINGS

SUNDRY CUTTING AND SHAPED STEELS

FILE STEEL

SPRING STEEL

MACHINERY STEELS

NORSWEDE INGOT-IRON

MAGNET STEEL

RIFLE-BARREL STEEL, ETC., ETC.

FORGINGS, ROLLS

AUTOMOBILE STEELS AND

CHROME-NICKEL STEEL CASTINGS

CARPENTER DIE-BLOCKS

All our die-blocks are forged and annealed with the utmost care, and supplied in the proper carbon-temper for the work. In our straight-carbon crucible tool-steel grades (pages 35 to 37) we usually furnish:—

Base, per lb.

Carpenter SPECIAL.....
Carpenter EXTRA.....
Carpenter COMET.....

Where a very large number of any one forging is required from a single set of dies, or where hard or very tough material like tool-steel, alloy-steel or copper is to be forged, we strongly recommend the use of one of the following grades:

Base, per lb.

READING DOUBLE SPECIAL Die-Blocks (page 58).....

Nickel-Steel Die-Blocks, made from specially selected 3½ per cent. nickel-steel, very carefully forged and handled.....

Open-Hearth Steel Die-Blocks of four kinds:

BERKSHIRE-R, light-annealed; to be hardened in water.....

BERKSHIRE-S, fully heat-treated and soft-annealed; to be hardened in water.....

BERKSHIRE-T, fully heat-treated and drawn to definite hardness according to size; ready for use.....

XYZ-Blocks, ready for use; or to be oil-quenched if great hardness is desired.....

All prices are subject to Classification, page 83.

Only the highest grade of steel should be ordered for costly dies.

To harden a die-block in the old-fashioned way, it is quenched in water or oil and the temper is drawn to a color or a file-test. A newer and far more accurate procedure is to quench the face, only, of the block in a flush of water or oil and then to draw in a bath of definite temperature to a given sclerescope hardness.

When the tempering is done in this way and when by successive trials the proper sclerescope hardness has been determined for getting the very best results from the die-block, this hardness can easily be duplicated and should always be closely adhered to for work of the same character.

Die-Block Classification

The following extras for weight per block are to be added to the base-price of the brand, or grade, of steel from which the die-blocks are ordered:

Under 1 pound			$0.25	each,	flat
1 to 1 15/16	pounds		.12	per lb.	extra
2 " 2 15/16	"		.11	"	"
3 " 4 15/16	"		.09	"	"
5 " 7 7/16	"		.08	"	"
7½ " 9 15/16	"		.07	"	"
10 " 14 15/16	"		.05	"	"
15 " 25 15/16	"		.03	"	"
25 pounds and over			.02	"	"

Annealing, 1 cent per pound extra.

Extras for Jewelers' Beveled Die-Blocks on application.

CARPENTER DISCS AND RINGS

For milling-cutters, punches and dies our regular lines of discs and rings are made of annealed Carpenter SPECIAL Tool-steel, No. 11 Temper, and of our STAR-ZENITH High-Speed steel. For gear-blanks and machine-parts they are made of treated and annealed Chrome-Nickel steel.

All discs of these grades are sold according to our price-list, pages 86-117. Any intermediate size, not given in the list, will be charged at the price of the next larger size. Where boxing is required, a reasonable charge will be made.

Always specify the full-forged size required, making your own allowance for finishing. We recommend ¼ inch in diameter and thickness for this purpose, but we make no allowance whatever unless so specified on orders.

DISC CLASSIFICATION

For grades of steel not covered by List, pages 86-117.

These extras for weight per disc are to be added to the base price of the steel from which the discs are ordered. For weight of discs, see page 223.

Under 1 pound			$0.25	each,	flat
1 to 1 15/16 pounds			.12	per lb.	extra
2 " 2 15/16 "			.11	"	"
3 " 4 15/16 "			.09	"	"
5 " 7 7/16 "			.08	"	"
7½ " 9 15/16 "			.07	"	"
10 " 14 15/16 "			.06	"	"
15 " 24 15/16 "			.05	"	"
25 pounds and over			.03	"	"

Annealing, 1 cent per pound extra.

RING EXTRAS

The following simple rule for computing the price of rings is based on the fact that a ring carries the same forging-extra as a solid disc of the same outside measurements, plus a charge for the steel represented by the hole and a charge of three cents per pound for the labor of making the hole.

RULE

Multiply weight of solid disc (page 223) by base-price of steel and divide product by weight of ring. Add disc extra as per disc classification for the solid disc and three cents for labor of making hole. The sum will be the selling-price per pound of the ring.

EXAMPLE

To find the price of a ring made of Carpenter SPECIAL Tool-Steel 9½ inches outside diameter, 1 inch thick, with 4¼ inch hole:—

Base-price of steel assumed at 16 cents per pound:

Weight of 9½ x 1 inch solid disc..... 20 lbs.
Weight of 4¼ x 1 inch disc (hole)..... 4 "
Weight of ring ..... 16 lbs.

Applying the rule..... $\frac{20 \times 16}{16}$ = 20 cts. per lb.

Disc extra for a 20 lb. disc (p. 84)..... 5 " " "
Charge for making hole ..... 3 " " "
Price without annealing.....28 " " "
Annealing, if specified ..... 1 " " "
Net price of annealed ring .....29 " " "

The difference between the base-price of the steel, 16 cents, and the net selling-price of the annealed ring, 29 cents, is the "ring extra"—in this case, 13 cents.

Disc Sizes and Prices

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
2	½	$0.26	$0.70	$0.30
2	¾	.27	.78	.31
2	1	.28	.96	.33
2	1¼	.29	1.10	.35
2	1½	.30	1.30	.37
2	1¾	.31	1.36	.39
2	2	.35	1.52	.44
2	2¼	.37	1.68	.46
2	2½	.39	1.84	.49
2	2¾	.42	2.00	.53
2	3	.45	2.16	.56
2	3¼	.48	2.32	.60
2	3½	.51	2.48	.64
2	3¾	.53	2.64	.66
2	4	.57	2.80	.71
2⅛	½	.20	.63	.25
2⅛	¾	.24	.81	.30
2⅛	1	.27	.99	.34
2⅛	1¼	.32	1.17	.40
2⅛	1½	.36	1.35	.45
2⅛	1¾	.39	1.53	.49
2⅛	2	.43	1.71	.54
2⅛	2¼	.47	1.90	.59
2⅛	2½	.51	2.08	.64

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
2⅛	2¾	.55	2.26	.69
2⅛	3	.59	2.44	.71
2⅛	3¼	.63	2.62	.79
2⅛	3½	.66	2.80	.83
2⅛	3¾	.70	2.98	.88
2⅛	4	.74	3.16	.93
2¼	½	.21	.71	.26
2¼	¾	.25	.91	.31
2¼	1	.29	1.11	.36
2¼	1¼	.33	1.32	.41
2¼	1½	.37	1.52	.46
2¼	1¾	.41	1.72	.51
2¼	2	.45	1.92	.56
2¼	2¼	.49	2.13	.61
2¼	2½	.53	2.33	.66
2¼	2¾	.57	2.53	.71
2¼	3	.61	2.73	.76
2¼	3¼	.65	2.94	.81
2¼	3½	.69	3.14	.86
2¼	3¾	.73	3.34	.91
2¼	4	.77	3.54	.96
2⅜	½	.23	.79	.29
2⅜	¾	.28	1.02	.35
2⅜	1	.32	1.24	.40

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
2⅜	1¼	.37	1.47	.46
2⅜	1½	.41	1.69	.51
2⅜	1¾	.45	1.92	.56
2⅜	2	.50	2.14	.63
2⅜	2¼	.54	2.37	.68
2⅜	2½	.59	2.59	.74
2⅜	2¾	.63	2.82	.79
2⅜	3	.67	3.05	.84
2⅜	3¼	.72	3.27	.90
2⅜	3½	.76	3.50	.95
2⅜	3¾	.81	3.72	1.01
2½	4	.85	3.95	1.06
2½	½	.26	.88	.33
2½	¾	.31	1.13	.39
2½	1	.36	1.38	.45
2½	1¼	.41	1.63	.51
2½	1½	.46	1.88	.58
2½	1¾	.51	2.13	.64
2½	2	.56	2.38	.70
2½	2¼	.61	2.63	.76
2½	2½	.66	2.88	.83
2½	2¾	.71	3.13	.89
2½	3	.76	3.38	.95
2½	3¼	.81	3.63	1.01

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
2½	3½	.86	3.88	1.08
2½	3¾	.91	4.13	1.14
2½	4	.96	4.38	1.20
2⅝	½	.28	.96	.35
2⅝	¾	.34	1.24	.43
2⅝	1	.39	1.52	.49
2⅝	1¼	.44	1.79	.55
2⅝	1½	.50	2.07	.63
2⅝	1¾	.55	2.34	.69
2⅝	2	.61	2.62	.76
2⅝	2¼	.66	2.87	.83
2⅝	2½	.72	3.17	.90
2⅝	2¾	.77	3.45	.96
2⅝	3	.82	3.72	1.03
2⅝	3¼	.88	4.00	1.10
2⅝	3½	.93	4.27	1.16
2⅝	3¾	.98	4.55	1.23
2⅝	4	1.04	4.82	1.30
2¾	½	.31	1.06	.39
2¾	¾	.37	1.36	.46
2¾	1	.43	1.66	.54
2¾	1¼	.49	1.97	.61
2¾	1½	.55	2.27	.69
2¾	1¾	.61	2.57	.76

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
2¾	2	.67	2.87	.84
2¾	2¼	.73	3.18	.91
2¾	2½	.79	3.48	.99
2¾	2¾	.85	3.78	1.06
2¾	3	.91	4.08	1.14
2¾	3¼	.97	4.39	1.21
2¾	3½	1.03	4.69	1.29
2¾	3¾	1.09	4.99	1.37
2¾	4	1.15	5.29	1.44
2⅞	½	.34	1.16	.43
2⅞	¾	.40	1.49	.50
2⅞	1	.47	1.82	.59
2⅞	1¼	.53	2.15	.67
2⅞	1½	.60	2.48	.75
2⅞	1¾	.66	2.81	.83
2⅞	2	.73	3.14	.91
2⅞	2¼	.79	3.47	.99
2⅞	2½	.86	3.80	1.08
2⅞	2¾	.92	4.13	1.15
2⅞	3	.98	4.46	1.23
2⅞	3¼	1.05	4.79	1.31
2⅞	3½	1.11	5.12	1.39
2⅞	3¾	1.18	5.46	1.48
2⅞	4	1.24	5.79	1.55

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
3	½	.37	1.26	.46
3	¾	.44	1.62	.55
3	1	.51	1.98	.64
3	1¼	.58	2.34	.73
3	1½	.66	2.70	.83
3	1¾	.73	3.06	.91
3	2	.80	3.42	1.00
3	2¼	.87	3.78	1.09
3	2½	.94	4.14	1.18
3	2¾	1.01	4.50	1.26
3	3	1.08	4.86	1.35
3	3¼	1.16	5.22	1.45
3	3½	1.23	5.58	1.54
3	3¾	1.30	5.94	1.63
3	4	1.37	6.30	1.71
3⅛	½	.40	1.37	.50
3⅛	¾	.48	1.76	.60
3⅛	1	.56	2.15	.70
3⅛	1¼	.64	2.54	.80
3⅛	1½	.72	2.93	.90
3⅛	1¾	.79	3.32	.99
3⅛	2	.87	3.71	1.09
3⅛	2¼	.95	4.10	1.19
3⅛	2½	1.03	4.49	1.29

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
3⅛	2¾	1.11	4.88	1.39
3⅛	3	1.19	5.27	1.49
3⅛	3¼	1.27	5.66	1.59
3⅛	3½	1.35	6.05	1.69
3⅛	3¾	1.43	6.45	1.79
3⅛	4	1.51	6.84	1.89
3¼	½	.43	1.48	.54
3¼	¾	.51	1.90	.64
3¼	1	.60	2.32	.75
3¼	1¼	.68	2.75	.85
3¼	1½	.77	3.17	.96
3¼	1¾	.86	3.59	1.08
3¼	2	.94	4.01	1.18
3¼	2¼	1.03	4.44	1.29
3¼	2½	1.11	4.86	1.39
3¼	2¾	1.20	5.28	1.50
3¼	3	1.28	5.70	1.60
3¼	3¼	1.37	6.13	1.71
3¼	3½	1.46	6.55	1.83
3¼	3¾	1.54	6.97	1.93
3¼	4	1.63	7.39	2.04
3⅜	½	.46	1.59	.58
3⅜	¾	.55	2.05	.69
3⅜	1	.64	2.51	.80

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
3⅜	1¼	.74	2.96	.93
3⅜	1½	.82	3.42	1.03
3⅜	1¾	.92	3.87	1.15
3⅜	2	1.01	4.33	1.26
3⅜	2¼	1.11	4.78	1.39
3⅜	2½	1.20	5.24	1.50
3⅜	2¾	1.29	5.70	1.61
3⅜	3	1.39	6.15	1.74
3⅜	3¼	1.48	6.61	1.85
3⅜	3½	1.57	7.06	1.96
3⅜	3¾	1.66	7.52	2.13
3⅜	4	1.76	7.97	2.20
3½	½	.49	1.72	.61
3½	¾	.59	2.21	.74
3½	1	.69	2.70	.86
3½	1¼	.79	3.19	.99
3½	1½	.89	3.68	1.11
3½	1¾	.99	4.17	1.24
3½	2	1.09	4.66	1.36
3½	2¼	1.19	5.15	1.49
3½	2½	1.28	5.64	1.60
3½	2¾	1.38	6.13	1.73
3½	3	1.48	6.62	1.83
3½	3¼	1.58	7.11	1.98

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
3½	3½	1.68	7.60	2.10
3½	3¾	1.78	8.09	2.23
3½	4	1.88	8.58	2.35
3⅝	½	.52	1.84	.65
3⅝	¾	.63	2.37	.79
3⅝	1	.73	2.89	.91
3⅝	1¼	.84	3.42	1.05
3⅝	1½	.95	3.94	1.19
3⅝	1¾	1.03	4.47	1.29
3⅝	2	1.16	4.99	1.45
3⅝	2¼	1.27	5.52	1.59
3⅝	2½	1.37	6.04	1.71
3⅝	2¾	1.48	6.57	1.85
3⅝	3	1.59	7.10	1.99
3⅝	3¼	1.69	7.62	2.11
3⅝	3½	1.80	8.15	2.25
3⅝	3¾	1.91	8.67	2.39
3⅝	4	2.01	9.20	2.50
3¾	½	.55	1.99	.69
3¾	¾	.67	2.53	.84
3¾	1	.78	3.09	.98
3¾	1¼	.89	3.66	1.11
3¾	1½	1.01	4.22	1.26
3¾	1¾	1.12	4.78	1.40

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
3¾	2	1.24	5.34	1.55
3¾	2¼	1.35	5.91	1.69
3¾	2½	1.47	6.47	1.84
3¾	2¾	1.58	7.03	1.98
3¾	3	1.69	7.59	2.11
3¾	3¼	1.81	8.16	2.26
3¾	3½	1.92	8.72	2.40
3¾	3¾	2.04	9.28	2.55
3¾	4	2.15	9.84	2.59
3⅞	½	.59	2.10	.74
3⅞	¾	.69	2.70	.86
3⅞	1	.83	3.30	1.04
3⅞	1¼	.95	3.90	1.19
3⅞	1½	1.07	4.50	1.34
3⅞	1¾	1.19	5.10	1.49
3⅞	2	1.32	5.70	1.65
3⅞	2¼	1.44	6.31	1.80
3⅞	2½	1.56	6.91	1.95
3⅞	2¾	1.68	7.51	2.10
3⅞	3	1.80	8.11	2.25
3⅞	3¼	1.93	8.71	2.41
3⅞	3½	2.05	9.31	2.56
3⅞	3¾	2.17	9.91	2.71
3⅞	4	2.29	10.51	2.86

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
4	½	.64	2.24	.80
4	¾	.77	2.88	.96
4	1	.90	3.52	1.13
4	1¼	1.03	4.16	1.29
4	1½	1.16	4.80	1.45
4	1¾	1.29	5.44	1.61
4	2	1.42	6.08	1.78
4	2¼	1.55	6.72	1.94
4	2½	1.68	7.36	2.10
4	2¾	1.81	8.00	2.26
4	3	1.94	8.64	2.43
4	3¼	2.07	9.28	2.59
4	3½	2.20	9.92	2.75
4	3¾	2.33	10.56	2.91
4	4	2.46	11.20	3.08
4	4¼	2.59	11.84	3.24
4	4½	2.72	12.48	3.40
4	4¾	2.85	13.12	3.56
4	5	2.98	13.76	3.73
4	5¼	3.11	14.40	3.88
4	5½	3.24	15.04	4.05
4	5¾	3.37	15.68	4.21
4	6	3.50	16.32	4.38
4¼	½	.73	2.53	.91

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
4¼	¾	.89	3.25	1.11
4¼	1	1.04	3.97	1.30
4¼	1¼	1.19	4.69	1.49
4¼	1½	1.34	5.41	1.68
4¼	1¾	1.49	6.14	1.86
4¼	2	1.64	6.86	2.05
4¼	2¼	1.80	7.58	2.25
4¼	2½	1.95	8.30	2.44
4¼	2¾	2.10	9.02	2.63
4¼	3	2.25	9.75	2.81
4¼	3¼	2.40	10.47	3.00
4¼	3½	2.55	11.19	3.19
4¼	3¾	2.70	11.91	3.38
4¼	4	2.86	12.64	3.58
4¼	4¼	3.01	13.36	3.75
4¼	4½	3.16	14.08	3.85
4¼	4¾	3.31	14.80	4.14
4¼	5	3.46	15.52	4.32
4¼	5¼	3.61	16.24	4.51
4¼	5½	3.76	16.96	4.70
4¼	5¾	3.92	17.66	4.90
4¼	6	4.07	18.40	5.09
4½	½	.82	2.84	1.03
4½	¾	.99	3.65	1.24

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
4½	1	1.16	4.46	1.45
4½	1¼	1.33	5.27	1.66
4½	1½	1.50	6.08	1.88
4½	1¾	1.67	6.89	2.09
4½	2	1.84	7.70	2.30
4½	2¼	2.01	8.51	2.51
4½	2½	2.18	9.32	2.73
4½	2¾	2.35	10.13	2.94
4½	3	2.52	10.94	3.15
4½	3¼	2.69	11.75	3.36
4½	3½	2.86	12.56	3.58
4½	3¾	3.03	13.37	3.79
4½	4	3.20	14.18	4.00
4½	4¼	3.37	14.89	4.21
4½	4½	3.54	15.70	4.43
4½	4¾	3.71	16.50	4.64
4½	5	3.88	17.30	4.85
4½	5¼	4.05	18.10	5.06
4½	5½	4.22	18.90	5.28
4½	5¾	4.39	19.70	5.49
4½	6	4.56	20.50	5.70
4¾	½	.91	3.16	1.14
4¾	¾	1.10	4.06	1.38
4¾	1	1.29	4.96	1.61

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
4¾	1¼	1.48	5.86	1.85
4¾	1½	1.66	6.76	2.08
4¾	1¾	1.85	7.67	2.31
4¾	2	2.04	8.57	2.55
4¾	2¼	2.23	9.47	2.79
4¾	2½	2.42	10.37	3.03
4¾	2¾	2.61	11.27	3.26
4¾	3	2.80	12.18	3.50
4¾	3¼	2.99	13.08	3.74
4¾	3½	3.18	13.98	3.98
4¾	3¾	3.37	14.88	4.31
4¾	4	3.55	15.79	4.44
4¾	4¼	3.74	16.69	4.68
4¾	4½	3.93	17.59	4.91
4¾	4¾	4.12	18.49	5.15
4¾	5	4.31	19.39	5.39
4¾	5¼	4.50	20.29	5.63
4¾	5½	4.69	21.19	5.86
4¾	5¾	4.88	22.09	6.10
4¾	6	5.07	22.99	6.34
5	½	1.02	3.50	1.28
5	¾	1.23	4.50	1.54
5	1	1.44	5.50	1.80
5	1¼	1.65	6.50	2.06

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
5	1½	1.86	7.50	2.33
5	1¾	2.07	8.50	2.59
5	2	2.29	9.50	2.86
5	2¼	2.50	10.50	3.13
5	2½	2.71	11.50	3.39
5	2¾	3.02	12.50	3.78
5	3	3.13	13.50	3.91
5	3¼	3.34	14.50	4.18
5	3½	3.55	15.50	4.44
5	3¾	3.76	16.50	4.70
5	4	3.97	17.50	4.97
5	4¼	4.18	18.50	5.23
5	4½	4.39	19.50	5.49
5	4¾	4.60	20.50	5.75
5	5	4.81	21.50	6.01
5	5¼	5.02	22.50	6.28
5	5½	5.23	23.50	6.54
5	5¾	5.44	24.50	6.80
5	6	5.65	25.50	7.06
5¼	½	1.16	3.86	1.45
5¼	¾	1.40	4.96	1.75
5¼	1	1.64	6.06	2.05
5¼	1¼	1.88	7.16	2.35
5¼	1½	2.12	8.26	2.65

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
5¼	1¾	2.36	9.37	2.95
5¼	2	2.60	10.47	3.25
5¼	2¼	2.84	11.57	3.55
5¼	2½	3.08	12.67	3.85
5¼	2¾	3.32	13.77	4.15
5¼	3	3.56	14.88	4.45
5¼	3¼	3.80	15.98	4.75
5¼	3½	4.04	17.08	5.05
5¼	3¾	4.28	18.18	5.35
5¼	4	4.52	19.29	5.65
5¼	4¼	4.76	20.39	5.95
5¼	4½	5.00	21.49	6.25
5¼	4¾	5.24	22.59	6.55
5¼	5	5.48	23.69	6.85
5¼	5¼	5.72	24.79	7.15
5¼	5½	5.96	25.89	7.45
5¼	5¾	6.20	26.99	7.75
5¼	6	6.44	28.09	8.05
5½	½	1.28	4.23	1.60
5½	¾	1.55	5.44	1.94
5½	1	1.81	6.65	2.26
5½	1¼	2.07	7.86	2.59
5½	1½	2.34	9.07	2.93
5½	1¾	2.60	10.28	3.25

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
5½	2	2.87	11.49	3.59
5½	2¼	3.13	12.70	3.91
5½	2½	3.40	13.91	4.25
5½	2¾	3.66	15.12	4.58
5½	3	3.92	16.33	4.80
5½	3¼	4.19	17.54	5.24
5½	3½	4.33	18.75	5.41
5½	3¾	4.72	19.96	5.90
5½	4	4.98	21.17	6.23
5½	4¼	5.24	22.38	6.55
5½	4½	5.51	23.58	6.89
5½	4¾	5.77	24.78	7.21
5½	5	6.04	26.00	7.55
5½	5¼	6.30	27.20	7.88
5½	5½	6.56	28.40	8.20
5½	5¾	6.83	29.60	8.54
5½	6	7.09	30.80	8.86
5¾	½	1.40	4.63	1.75
5¾	¾	1.69	5.95	2.11
5¾	1	1.97	7.27	2.46
5¾	1¼	2.26	8.59	2.83
5¾	1½	2.55	9.91	3.19
5¾	1¾	2.83	11.24	3.54
5¾	2	3.12	12.56	3.90

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
5¾	2¼	3.41	13.88	4.26
5¾	2½	3.69	15.20	4.61
5¾	2¾	3.98	16.52	4.98
5¾	3	4.27	17.85	5.34
5¾	3¼	4.55	19.17	5.69
5¾	3½	4.84	20.49	6.05
5¾	3¾	5.13	21.81	6.36
5¾	4	5.41	23.14	6.76
5¾	4¼	5.70	24.46	7.13
5¾	4½	5.99	25.78	7.49
5¾	4¾	6.28	27.10	7.85
5¾	5	6.56	28.42	8.20
5¾	5¼	6.85	29.74	8.56
5¾	5½	7.14	31.06	8.93
5¾	5¾	7.42	32.38	9.28
5¾	6	7.71	33.70	9.64
6	½	1.53	5.04	1.91
6	¾	1.84	6.48	2.30
6	1	2.15	7.92	2.69
6	1¼	2.47	9.36	3.09
6	1½	2.78	10.80	3.48
6	1¾	3.09	12.24	3.86
6	2	3.40	13.68	4.25
6	2¼	3.71	15.12	4.64

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
6	2½	4.02	16.56	5.03
6	2¾	4.34	18.00	5.43
6	3	4.65	19.44	5.81
6	3¼	4.96	20.88	6.20
6	3½	5.28	22.32	6.60
6	3¾	5.59	23.76	6.99
6	4	5.90	25.20	7.38
6	4¼	6.21	26.64	7.76
6	4½	6.52	28.08	8.15
6	4¾	6.84	29.52	8.55
6	5	7.15	30.96	8.94
6	5¼	7.46	32.40	9.33
6	5½	7.77	33.84	9.71
6	5¾	8.09	35.28	10.11
6	6	8.40	36.72	10.50
6¼	½	1.74	5.47	2.18
6¼	¾	2.11	7.03	2.64
6¼	1	2.47	8.59	3.09
6¼	1¼	2.84	10.15	3.55
6¼	1½	3.21	11.71	4.01
6¼	1¾	3.58	13.28	4.48
6¼	2	3.94	14.84	4.93
6¼	2¼	4.31	16.40	5.39
6¼	2½	4.68	17.96	5.85

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
6¼	2¾	5.04	19.52	6.30
6¼	3	5.41	21.09	6.74
6¼	3¼	5.78	22.65	7.23
6¼	3½	6.15	24.21	7.69
6¼	3¾	6.51	25.77	8.16
6¼	4	6.88	27.34	8.60
6¼	4¼	7.25	28.90	9.06
6¼	4½	7.61	30.46	9.51
6¼	4¾	7.98	32.02	9.98
6¼	5	8.35	33.58	10.44
6¼	5¼	8.71	35.14	10.89
6¼	5½	9.08	36.70	11.35
6¼	5¾	9.45	38.26	11.81
6¼	6	9.82	39.82	12.28
6½	½	1.86	5.91	2.33
6½	¾	2.26	7.60	2.83
6½	1	2.66	9.29	3.33
6½	1¼	3.05	10.98	3.81
6½	1½	3.46	12.67	4.33
6½	1¾	3.85	14.36	4.81
6½	2	4.24	16.05	5.30
6½	2¼	4.64	17.74	5.80
6½	2½	5.04	19.43	6.30
6½	2¾	5.43	21.12	6.79

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
6½	3	5.83	22.81	7.29
6½	3¼	6.22	24.50	7.78
6½	3½	6.63	26.19	8.29
6½	3¾	7.02	27.88	8.78
6½	4	7.42	29.57	9.28
6½	4¼	7.82	31.27	9.78
6½	4½	8.22	32.97	10.28
6½	4¾	8.61	34.67	10.75
6½	5	9.01	36.37	11.26
6½	5¼	9.41	38.07	11.76
6½	5½	9.80	39.77	12.25
6½	5¾	10.20	41.47	12.75
6½	6	10.60	43.17	13.25
6¾	½	1.98	6.38	2.48
6¾	¾	2.41	8.20	3.01
6¾	1	2.83	10.02	3.54
6¾	1¼	3.26	11.84	4.08
6¾	1½	3.68	13.66	4.60
6¾	1¾	4.11	15.49	5.14
6¾	2	4.54	17.31	5.68
6¾	2¼	4.96	19.13	6.20
6¾	2½	5.39	20.95	6.74
6¾	2¾	5.81	22.77	7.26
6¾	3	6.24	24.60	7.80

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
6¾	3¼	6.67	26.42	8.34
6¾	3½	7.09	28.24	8.86
6¾	3¾	7.52	30.06	9.40
6¾	4	7.94	31.89	9.93
6¾	4¼	8.37	33.71	10.46
6¾	4½	8.80	35.53	11.20
6¾	4¾	9.22	37.35	11.53
6¾	5	9.65	39.17	12.06
6¾	5¼	10.07	40.99	12.59
6¾	5½	10.50	42.81	13.13
6¾	5¾	10.93	44.63	13.66
6¾	6	11.35	46.45	14.19
7	½	2.10	6.86	2.63
7	¾	2.55	8.82	3.19
7	1	3.01	10.78	3.76
7	1¼	3.46	12.74	4.33
7	1½	3.92	14.70	4.90
7	1¾	4.37	16.66	5.46
7	2	4.83	18.62	6.04
7	2¼	5.28	20.58	6.60
7	2½	5.74	22.54	7.18
7	2¾	6.19	24.50	7.73
7	3	6.65	26.46	8.29
7	3¼	7.10	28.42	8.88

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
7	3½	7.56	30.38	9.45
7	3¾	8.01	32.34	10.01
7	4	8.47	34.30	10.59
7	4¼	8.92	36.26	11.15
7	4½	9.38	38.22	11.73
7	4¾	9.83	40.18	12.29
7	5	10.29	42.14	12.86
7	5¼	10.74	44.10	13.43
7	5½	11.20	46.06	14.00
7	5¾	11.65	48.02	14.56
7	6	12.11	49.98	15.14
7¼	½	2.27	7.36	2.84
7¼	¾	2.78	9.46	3.48
7¼	1	3.28	11.56	4.10
7¼	1¼	3.78	13.66	4.73
7¼	1½	4.29	15.76	5.36
7¼	1¾	4.79	17.87	5.99
7¼	2	5.30	19.97	6.63
7¼	2¼	5.80	22.07	7.25
7¼	2½	6.30	24.17	7.88
7¼	2¾	6.81	26.27	8.51
7¼	3	7.31	28.38	9.14
7¼	3¼	7.82	30.49	9.88
7¼	3½	8.32	32.59	10.40

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
7¼	3¾	8.82	34.69	11.03
7¼	4	9.33	36.79	11.66
7¼	4¼	9.83	38.89	12.29
7¼	4½	10.34	40.99	12.94
7¼	4¾	10.84	43.09	13.55
7¼	5	11.34	45.19	14.18
7¼	5¼	11.85	47.29	14.81
7¼	5½	12.35	49.39	15.44
7¼	5¾	12.86	51.49	16.08
7¼	6	13.36	53.60	16.70
7½	½	2.41	7.88	3.01
7½	¾	2.94	10.13	3.68
7½	1	3.48	12.38	4.35
7½	1¼	4.02	14.63	5.03
7½	1½	4.56	16.88	5.70
7½	1¾	5.10	19.13	6.38
7½	2	5.63	21.38	7.04
7½	2¼	6.17	23.63	7.71
7½	2½	6.71	25.88	8.39
7½	2¾	7.25	28.13	9.06
7½	3	7.79	30.38	9.74
7½	3¼	8.32	32.63	10.40
7½	3½	8.86	34.88	11.08
7½	3¾	9.40	37.13	11.75

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
7½	4	9.94	39.38	12.43
7½	4¼	10.48	41.64	13.10
7½	4½	11.01	43.90	13.76
7½	4¾	11.55	46.16	14.44
7½	5	12.09	48.42	15.11
7½	5¼	12.63	50.68	15.79
7½	5½	13.17	52.94	16.47
7½	5¾	13.71	55.20	17.14
7½	6	14.25	57.46	17.81
7¾	½	2.54	8.41	3.18
7¾	¾	3.11	10.81	3.89
7¾	1	3.69	13.21	4.61
7¾	1¼	4.26	15.61	5.33
7¾	1½	4.83	18.01	6.04
7¾	1¾	5.41	20.42	6.76
7¾	2	5.88	22.82	7.35
7¾	2¼	6.55	25.22	8.19
7¾	2½	7.13	27.62	8.91
7¾	2¾	7.70	30.02	9.63
7¾	3	8.27	32.43	10.34
7¾	3¼	8.85	34.83	11.06
7¾	3½	9.42	37.23	11.78
7¾	3¾	10.00	39.63	12.50
7¾	4	10.57	42.04	13.21

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
7¾	4¼	11.14	44.44	13.93
7¾	4½	11.72	46.84	14.66
7¾	4¾	12.29	49.24	15.36
7¾	5	12.86	51.65	16.08
7¾	5¼	13.44	54.05	16.80
7¾	5½	14.01	56.46	17.51
7¾	5¾	14.58	58.86	18.23
7¾	6	15.16	61.26	18.96
8	½	2.67	8.96	3.34
8	¾	3.28	11.52	4.10
8	1	3.89	14.08	4.86
8	1¼	4.50	16.64	5.63
8	1½	5.11	19.20	6.39
8	1¾	5.71	21.76	7.14
8	2	6.32	24.32	7.90
8	2¼	6.93	26.88	8.66
8	2½	7.54	29.44	9.43
8	2¾	8.15	32.00	10.19
8	3	8.75	34.56	10.94
8	3¼	9.36	37.12	11.70
8	3½	9.97	39.68	12.46
8	3¾	10.58	42.24	13.23
8	4	11.19	44.80	13.99
8	4¼	11.79	47.36	14.74

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
8	4½	12.40	49.92	15.50
8	4¾	13.01	52.48	16.24
8	5	13.62	55.04	17.03
8	5¼	14.23	57.60	17.79
8	5½	14.83	60.16	18.54
8	5¾	15.44	62.72	19.30
8	6	16.05	65.28	20.06
8¼	½	2.88	9.53	3.85
8¼	¾	3.55	12.25	4.44
8¼	1	4.21	14.97	5.26
8¼	1¼	4.88	17.69	6.10
8¼	1½	5.55	20.41	6.94
8¼	1¾	6.22	23.14	7.78
8¼	2	6.88	25.86	8.60
8¼	2¼	7.55	28.58	9.44
8¼	2½	8.22	31.30	10.28
8¼	2¾	8.88	34.02	11.10
8¼	3	9.55	36.75	11.94
8¼	3¼	10.22	39.47	12.78
8¼	3½	10.88	42.19	13.60
8¼	3¾	11.55	44.91	14.44
8¼	4	12.22	47.64	15.28
8¼	4¼	12.88	50.36	16.10
8¼	4½	13.55	53.08	16.94

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
8¼	4¾	14.22	55.80	17.78
8¼	5	14.89	58.52	18.61
8¼	5¼	15.55	61.24	19.44
8¼	5½	16.22	63.96	20.28
8¼	5¾	16.89	66.68	21.11
8¼	6	17.55	69.40	21.94
8½	½	3.03	10.12	3.79
8½	¾	3.74	13.01	4.68
8½	1	4.45	15.90	5.56
8½	1¼	5.15	18.79	6.44
8½	1½	5.86	21.68	7.33
8½	1¾	6.57	24.57	8.21
8½	2	7.28	27.46	9.10
8½	2¼	7.98	30.35	9.98
8½	2½	8.69	33.24	10.86
8½	2¾	9.40	36.13	11.75
8½	3	10.11	39.02	12.64
8½	3¼	10.81	41.91	13.51
8½	3½	11.52	44.80	14.40
8½	3¾	12.23	47.69	15.29
8½	4	12.94	50.58	16.18
8½	4¼	13.64	53.46	17.05
8½	4½	14.35	56.34	17.94
8½	4¾	15.06	59.22	18.83

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
8½	5	15.76	62.10	19.70
8½	5¼	16.47	64.98	20.59
8½	5½	17.18	67.86	21.48
8½	5¾	17.89	70.74	22.36
8½	6	18.59	73.62	23.24
8¾	½	3.18	10.72	3.98
8¾	¾	3.93	13.78	4.91
8¾	1	4.68	16.84	5.85
8¾	1¼	5.42	19.90	6.78
8¾	1½	6.17	22.96	7.73
8¾	1¾	6.92	26.03	8.65
8¾	2	7.67	29.09	9.59
8¾	2¼	8.41	32.15	10.51
8¾	2½	9.16	35.21	11.45
8¾	2¾	9.91	38.27	12.39
8¾	3	10.66	41.34	13.33
8¾	3¼	11.40	44.40	14.25
8¾	3½	12.15	47.46	15.19
8¾	3¾	12.90	50.52	16.13
8¾	4	13.65	53.59	17.06
8¾	4¼	14.39	56.65	17.99
8¾	4½	15.14	59.71	18.93
8¾	4¾	15.89	62.77	19.86
8¾	5	16.64	65.83	20.80

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
8¾	5¼	17.38	68.89	21.73
8¾	5½	18.13	71.95	22.66
8¾	5¾	18.88	75.01	23.60
8¾	6	19.63	78.07	24.54
9	½	3.33	11.34	4.16
9	¾	4.12	14.58	5.15
9	1	4.91	17.82	6.14
9	1¼	5.70	21.06	7.13
9	1½	6.49	24.30	8.11
9	1¾	7.28	27.54	9.10
9	2	8.06	30.78	10.08
9	2¼	8.85	34.02	11.06
9	2½	9.64	37.26	12.05
9	2¾	10.43	40.50	13.04
9	3	11.22	43.74	14.03
9	3¼	12.01	46.98	15.01
9	3½	12.79	50.22	15.99
9	3¾	13.58	53.46	16.98
9	4	14.37	56.70	17.96
9	4¼	15.16	59.94	18.95
9	4½	15.95	63.18	19.94
9	4¾	16.74	66.42	20.93
9	5	17.52	69.66	21.90
9	5¼	18.31	72.90	22.89

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
9	5½	19.10	76.14	23.78
9	5¾	19.89	79.38	24.85
9	6	20.68	82.62	25.85
9¼	½	3.65	12.04	4.56
9¼	¾	4.53	15.50	5.66
9¼	1	5.41	18.96	6.76
9¼	1¼	6.29	22.42	7.86
9¼	1½	7.18	25.86	8.98
9¼	1¾	8.06	29.28	10.08
9¼	2	8.94	32.70	11.18
9¼	2¼	9.82	36.12	12.25
9¼	2½	10.71	39.54	13.39
9¼	2¾	11.59	42.96	14.49
9¼	3	12.47	46.38	15.59
9¼	3¼	13.35	49.80	16.69
9¼	3½	14.24	53.22	17.55
9¼	3¾	15.12	56.64	18.90
9¼	4	16.00	60.06	20.00
9¼	4¼	16.88	63.48	21.10
9¼	4½	17.77	66.90	22.21
9¼	4¾	18.65	70.32	23.31
9¼	5	19.53	73.74	24.41
9¼	5¼	20.41	77.16	25.51
9¼	5½	21.30	80.58	26.63

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

DISC SIZES AND PRICES
Continued

Diameter, Inches	Length or Thickness, Inches	Net Price Per Disc		
		Special	Star-Zenith	Chrome-Nickel
9¼	5¾	22.18	84.00	27.73
9¼	6	23.06	87.42	28.83
9½	½	3.82	12.69	4.78
9½	¾	4.75	16.31	5.94
9½	1	5.68	19.93	7.10
9½	1¼	6.61	23.55	8.26
9½	1½	7.54	27.17	9.43
9½	1¾	8.47	30.79	10.59
9½	2	9.40	34.41	11.75
9½	2¼	10.33	38.03	12.89
9½	2½	11.26	41.65	14.08
9½	2¾	12.19	45.27	15.24
9½	3	13.12	48.89	16.40
9½	3¼	14.05	52.51	17.31
9½	3½	14.98	56.13	18.73
9½	3¾	15.92	59.75	19.80
9½	4	16.85	63.37	21.06
9½	4¼	17.78	66.99	22.23
9½	4½	18.71	70.61	23.39
9½	4¾	19.64	74.23	24.55
9½	5	20.57	77.85	25.71
9½	5¼	21.50	81.47	26.88
9½	5½	22.43	85.09	28.04
9½	5¾	23.36	88.71	29.20
9½	6	24.29	92.33	30.36

Annealing included for SPECIAL and STAR-ZENITH
Treating and Annealing included for CHROME-NICKEL

SUNDRY CUTTING STEELS

CUTLERY STEEL

		Base, per lb.
No. A-1.	Best Butcher-Knife	
" 1.	Best Carver	
" 2.	Butcher	
" 3.	Table-Knife	
" 4.	Solid Blade	
" 14.	Fork	
	Double-Bevel	
	Knife-Back Spring	

TOOL-STEEL—Various grades, carbon-tempers and sizes for surgical and other fine cutting instruments: subject to Tool-Steel Classification, page 64.

CLASSIFICATION

ROUND AND SQUARE

3/8 to 3/4 inch inclusive	Base
	Extra per lb., Cents
11/32 to 23/64 inch	0.5
5/16 inch	1.0
1/4 to 9/32 inch	2.0

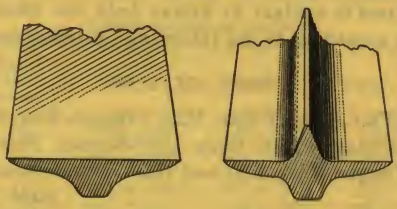
FLAT

1¼ to 2½ inches wide x 16 ga. and heavier	Base
	Extra per lb., Cents
1¼ to 2½ inches wide x 17 to 19 ga. inclusive	1.0
3/4 to 1 3/16 inch wide x 16 ga. and heavier	0.5
3/4 to 1 3/16 inch wide x 17 to 19 ga. inclusive	1.5
½ to 1 1/16 inch wide x 3/16 inch and heavier	0.5
½ to 1 1/16 inch wide x 5/32 inch to 16 ga. inclusive,	1.0
3/8 to 15/32 inch wide x 3/16 inch and heavier	1.0

DOUBLE BEVEL

	Extra per lb., Cents
2 to 2½ inches wide x 16 ga. and heavier	0.75
2 to 2½ inches wide x 18 ga.	1.0
1¾ and 1⅞ inch wide x 16 ga. and heavier	1.5

AXE AND HATCHET STEEL



	Per lb.
Plain	.....
Bevelled	.....
Overcoat, Carpenter	.....
Overcoat, Monarch	.....

RAZOR STEEL

	Base, per lb.
Extra-Special	.....
Extra	.....
Crucible	.....

Subject to Tool-Steel Classification, page 64.

LAWN-MOWER STEEL

Cutter-Bar and Reel-Knife in all Shapes.

	Per lb.
Crucible	.....
Open-Hearth	.....

AUGER-BIT STEEL

	Per lb.
Crucible	.....
Open-Hearth	.....

COAL-AUGER STEEL

	Per lb.
Crucible	.....
Open-Hearth	.....

FILE STEEL

File steel is subject to extras both for Shape and for Size according to the following Classification:

SHAPE-EXTRAS

Square, Flat, Hand, Pillar, Mill, Cabinet, Round, Half-Round, High Back Half-Round, Plain and Tanged Rasp, Flat and Half-Round Shoe-Rasp ..... Base shapes

Extra, per lb.

Knife, Cross, Crossing, Cross-Cut (except Great American), Warding, Cant, Cant-Saw, Feather-Edge, Pit-Saw ..... 3c.

Great American Cross-Cut, Taper, Slim-Taper .... 2c.

All shapes not otherwise provided for ..... 3½c.

SIZE-EXTRAS

In addition to Shape-Extras.

All shapes except Taper and Slim-Taper, 8-inch and over ..... Base sizes

All shapes except Taper and Slim-Taper, under 8-inch, take extras for size as follows:

Size (inch)	7½	7	6½	6	5½	5	4½	4	3½	3
Extra, cents per lb.	½	1	1½	2	2½	3	3½	4	4½	5

Taper, 4-inch and over ..... Base sizes

Taper, under 4-inch:—Size (inch)	3½	3	2½
Extra, cents per lb.	1	4	8

Slim-Taper, 6-inch and over ..... Base sizes

Slim-Taper, under 6-in.:—Size (in.)	5½	5	4½	4	3½
Extra, cents per lb.	½	1	2½	4	6½

FILE STEEL SHAPES AND SIZES

Dimensions in Inches

No. Inch	Square and Round	Flat	Mill	Taper	Slim Taper
2	.075	.240 x .060	.240 x .045	.134	.100
2½	.094	.288 x .072	.288 x .054	.167	.134
3	.113	.335 x .084	.335 x .063	.234	.167
3½	.131	.384 x .096	.384 x .072	.302	.201
4	.150	.430 x .107	.430 x .081	.369	.234
4½	.169	.478 x .119	.478 x .089	.402	.268
5	.188	.525 x .131	.525 x .098	.436	.302
5½	.206	.573 x .143	.573 x .107	.470	.335
6	.225	.620 x .155	.620 x .116	.503	.369
6½	.....	.668 x .167	.....	.....	.402
7	.263	.715 x .179	.715 x .134	.570	.436
8	.300	.810 x .202	.810 x .152	.638	.503
9	.338	.905 x .226	.905 x .170	.705	.570
10	.375	1.000 x .250	1.000 x .187	.772	.638
11	.438	1.090 x .272	1.090 x .204	.839	.705
12	.500	1.180 x .295	1.180 x .221	.906	.772
13	.563	1.270 x .317	1.270 x .238	.973	.839
14	.625	1.360 x .340	1.360 x .255	1.041	.906
15	.688	1.450 x .362	1.450 x .272	1.108	.973
16	.750	1.540 x .385	1.540 x .289	1.175	1.041
17	.813	1.630 x .407	1.630 x .306	.....	1.108
18	.875	1.720 x .430	1.720 x .322	.....	1.175
19	.938	1.810 x .452	.....	.....	.....
20	1.000	1.900 x .475	.....	.....	.....
21	1.063	.....	.....	.....	.....
22	1.125	.....	.....	.....	.....
23	1.188	.....	.....	.....	.....
24	1.250	.....	.....	.....	.....

FILE STEEL SHAPES AND SIZES

Continued

Dimensions in Inches

No. Inch	Pillar	Hand	Warding	Cabinet
2	.188 x .094	.335 x .084	.286 x .036	.....
2½	.219 x .110	.384 x .096	.329 x .041	.....
3	.250 x .125	.430 x .107	.371 x .046	.....
3½	.281 x .141	.478 x .119	.414 x .052	.....
4	.313 x .157	.525 x .131	.457 x .057	.....
4½	.344 x .172	.573 x .143	.500 x .062	.....
5	.375 x .188	.620 x .155	.543 x .068	.....
5½	.406 x .203	.668 x .167	.586 x .073	.....
6	.438 x .219	.715 x .179	.629 x .079	.700 x .131
7	.500 x .250	.810 x .202	.714 x .089	.806 x .151
8	.563 x .281	.905 x .226	.800 x .100	.911 x .171
9	.625 x .313	1.000 x .250	.886 x .111	1.017 x .191
10	.688 x .344	1.090 x .272	.971 x .121	1.122 x .210
11	.750 x .375	1.180 x .295	1.057 x .132	1.228 x .230
12	.813 x .406	1.270 x .317	1.143 x .143	1.333 x .250
13	.875 x .438	1.360 x .340	1.229 x .154	1.439 x .269
14	.938 x .469	1.450 x .362	1.314 x .164	1.544 x .290
15	1.000 x .500	1.540 x .385	.....	1.650 x .309
16	1.063 x .531	1.630 x .407	.....	1.756 x .329
17	1.125 x .563	1.720 x .430	.....	1.861 x .349
18	1.188 x .594	1.810 x .452	.....	1.967 x .369
19	1.250 x .625	1.900 x .475	.....	.....
20	1.313 x .656	1.990 x .497	.....	.....

FILE STEEL SHAPES AND SIZES

Continued

Dimensions in Inches

No. Inch	Pitsaw, or Semi-Circular	Half-Round	High-Back Half-Round	Knife
2	.188 x .094	.240 x .069	.222 x .082	.269 x .067 & .020
2½	.219 x .110	.288 x .082	.261 x .097	.320 x .080 & .021
3	.250 x .125	.336 x .096	.300 x .111	.370 x .092 & .023
3½	.281 x .141	.383 x .109	.339 x .126	.421 x .105 & .024
4	.313 x .157	.431 x .123	.378 x .140	.471 x .118 & .026
4½	.344 x .172	.479 x .137	.417 x .154	.522 x .130 & .027
5	.375 x .188	.527 x .151	.456 x .169	.572 x .143 & .029
5½	.406 x .203	.574 x .164	.495 x .183	.623 x .156 & .030
6	.438 x .219	.622 x .178	.533 x .197	.673 x .168 & .032
7	.500 x .250	.718 x .205	.611 x .226	.774 x .193 & .035
8	.563 x .281	.813 x .232	.689 x .255	.875 x .219 & .038
9	.625 x .313	.909 x .260	.767 x .284	.976 x .244 & .041
10	.688 x .344	1.004 x .287	.844 x .313	1.077 x .269 & .044
11	.750 x .375	1.100 x .314	.922 x .341	1.178 x .294 & .047
12	.813 x .406	1.195 x .341	1.000 x .370	1.279 x .320 & .050
13	.875 x .438	1.291 x .369	1.078 x .399	1.380 x .345 & .053
14	.938 x .469	1.387 x .396	1.156 x .428	1.481 x .370 & .056
15	1.000 x .500	1.482 x .423	1.233 x .457	.....
16	1.063 x .531	1.578 x .451	1.311 x .486	.....
17	1.125 x .563	1.673 x .478	1.389 x .514	.....
18	1.188 x .594	1.769 x .505	1.467 x .543	.....
19	1.250 x .625	1.864 x .533	1.544 x .572	.....
20	1.313 x .656	1.960 x .560	1.622 x .601	.....

FILE STEEL SHAPES AND SIZES

Continued

Dimensions in Inches

No. Inch	Plain Rasp	Tanged Rasp	No. Inch	Half-Round Shoe Rasp		
				Width	Thickness	
					Centre	Edges
10	1.110 x .241	1.300 x .283	6	.700	.175	.117
11	1.205 x .262	1.395 x .303	7	.792	.198	.132
12	1.300 x .283	1.490 x .324	8	.883	.221	.147
13	1.395 x .303	1.585 x .344	9	.975	.244	.162
14	1.490 x .324	1.680 x .365	10	1.067	.267	.178
15	1.585 x 344	1.775 x .386	11	1.158	.289	.193
16	1.680 x .365	1.870 x .407	12	1.250	.312	.208
17	1.775 x 386	.....	13	1.342	.335	.224
18	1.870 x .407	.....	14	1.433	.358	.239

CARPENTER PIVOT-STEEL

Very accurately hot-rolled to size for use in the manufacture of scales. Supplied in crucible and open-hearth grades that can be hardened to any desired degree without unduly sacrificing the toughness that is necessary to withstand the shock of loads suddenly thrown upon the scales.

	Base, per lb.
Crucible	.....
Open-Hearth	.....

Subject to Classification, page 125.

Sizes smaller than No. 10 are usually furnished cold-drawn. Prices on application.

PIVOT-STEEL CLASSIFICATION

No.	FAIRBANKS, Inch	Extra per lb. cts.	HOWE, Inch	Extra per lb. cts.	HOBSON, Inch	Extra per lb. cts.
1	3/16 x 1/8	20	1 1/4 x 15/16	Base	1 1/4 scant x 1 scant	Base
2	1/4 x 3/16	6	1 1/16 x 25/32	"	1 full x 3/4 full	"
3	19/64 x 7/32	5	29/32 x 23/32	"	7/8 x 11/16	"
4	21/64 x 1/4	2	25/32 x 19/32	"	13/16 x 9/16 full	"
5	3/8 x 9/32	2	23/32 x 1/2	"	11/16 x 1/2	"
6	7/16 x 5/16	Base	7/16 x 5/16	"	5/8 x 15/32	"
7	1/2 x 3/8	"	9/16 x 13/32	"	9/16 x 13/32	"
7 1/2	9/16 x 13/32	"	1/2 x 11/32	"		
8	19/32 x 7/16	"	7/16 x 19/64	2	1/2 x 11/32	"
9	5/8 x 15/32	"	13/32 x 9/32	2	15/32 x 5/16	"
10	11/16 x 1/2	"	3/8 x 1/4	2	3/8 x 9/32	2
11	3/4 x 9/16	"	17/64 x 3/16	5	11/32 x 1/4	2
12	15/16 x 11/16	"	15/64 x 5/32	9	1/4 x 5/32	9
13	1 1/32 x 13/16	"	.....	....	7/32 x 5/32	12
14	.....	....	.....	....	3/16 x 1/8	20
4E	7/8 x 5/8	"	.....	....	.....	....
3E	1 1/16 x 3/4	"	.....	....	.....	....
2E	1 3/16 x 7/8	"	.....	....	.....	....
1E	1 5/16 x 1	"	.....	....	.....	....
0E	1 1/2 x 1 1/8	"	.....	....	.....	....

CARPENTER SPRING-STEELS

In addition to choice selected grades of crucible and open-hearth straight-carbon spring-steel, we make a specialty of producing several types of superior alloy spring-steel, characterized by remarkable strength, resilience and endurance. The great fatigue-value of these steels and their unusual fibre-strength qualify them especially for the making of high-grade automobile springs and for meeting other difficult and exacting requirements.

Correspondence cordially solicted.

STRAIGHT-CARBON SPRING-STEELS

	Base, per lb.
Crucible Spring-Steel	.....
Special Open-Hearth Spring-Steel	.....

ALLOY SPRING-STEELS

Flexo Spring-Steel	.....
Victor Spring-Steel	.....
Chrome-Vanadium Spring-Steel	.....
Presto Spring-Steel (See page 61)	.....

Prices subject to Classification, page 127.

Spring-Steel Classification

Crucible and Open-Hearth

ALL DIMENSIONS INCLUSIVE

Intermediate Sizes Take the Next Higher Extra.

Round and Square

Inch	
5/8 to 1½	Base
	Extra per lb., Cents
½ to 9/16	0.2
3/8 to 7/16	0.5
5/16	1.0
¼ to 9/32	1.5
3/16	3.0
⅛	5.0

Flat

Inches	
1¼ to 4 x .238 to .500 (4 B.W.G. to ½ in.)	Base
	Extra per lb., Cents
1 to 1⅛ x .300 to .238 (1 to 4 B.W.G.)	0.2
1 to 3 x .220 to .180 (5 to 7 ")	0.5
¾ to 15/16 x .300 to .180 (1 to 7 ")	0.5
⅜ to 1 1/16 x .300 to .180 (1 to 7 ")	1.0
¾ to 3 x .165 to .134 (8 to 10 ")	1.0
¾ to 3 x .120 to .065 (11 to 16 ")	1.5

Cutting

Cutting to multiples or specified lengths:
24 inches or longer.....0.2 c. per lb.
Shorter than 24 inches according to agreement.

Quantity Differentials

All specifications for less than 2000 pounds of a size will be subject to extras according to the total weight of the size ordered:

	Extra per lb., Cents
Less than 2000 lbs., but not less than 1000 lbs.	0.3
Less than 1000 lbs.	0.7

CARPENTER MACHINERY STEELS

Made of choice selected stock, free from seams, pipe, slivers and other flaws that are so commonly found in bar-steel. Machines readily. Hot-rolled and mill-planished in sizes from ¼ inch to 5 inches diameter.

	Base, per lb.
Crucible Machinery Steel	
Open-Hearth Machinery Steel	
Star Brand, about .35% carbon	
Special Brand, about .17% carbon	

Subject to Classifications, pages 129-131.

MACHINE PLANISHED

Supplied in rounds from ¼ inch to 2 inches diameter and of specially smooth finish; straightened and cut to exact length when required.

Guaranteed in true rounds, accurate to size within .01 inch.

Our Planished Steel is rolled with very great care from specially selected stocks to insure the best results obtainable in high-class hot-rolling.

NOTE

The Machinery Steel Classifications on pages 129 to 131 are given for the convenience of our customers, without implying that we are at all times prepared to furnish the entire range of sizes they cover.

CRUCIBLE MACHINERY STEEL
CLASSIFICATION
ALL DIMENSIONS INCLUSIVE

Intermediate Sizes Take the Next Higher Extra

ROLLED ROUND AND SQUARE

¾ to 3 inches	Base
Inches	**Extra per lb., Cents**
½ to 1 1/16	0.3
⅜ to 7/16	0.5
5/16 to 1 1/32	1.0
¼ to 9/32	1.5
3/16	3.0
3 1/16 to 4	1.0
4 1/16 to 5	1.5

HAMMERED ROUND AND SQUARE

Inches	**Extra per lb., Cents**
3 1/16 to 4	1.0
4 1/16 to 6	1.5
6 1/16 to 7	2.0

HEXAGON

One cent per pound extra throughout the above list.

ROLLED FLAT

⅝ inch to 2 inches wide by 9/16 inch to 2 inches thick, inclusive.....Base

The extras for Flat are one-half those of the Tool-Steel Classification, page 64.

CUTTING

Cutting to specified single and multiple lengths, 24 inches and over, 0.5 cent per pound. Shorter than 24 inches, according to agreement.

Machine-cutting, planishing and straightening according to agreement.

Same Quantity Differentials as on page 131.

Open-Hearth Machinery Steel

Classification

ALL DIMENSIONS INCLUSIVE

Intermediate Sizes Take the Next Higher Extra

Rolled Round and Square

¾ inch to 3 inches	Base
Inches	**Extra per lb., Cents**
¼ and 9/32	0.7
5/16	0.6
⅜	0.5
7/16	0.4
½ to 9/16	0.2
⅝ to 11/16	0.1
3 1/16 to 3½	0.3
3 9/16 to 4	0.5
4 1/16 to 4½	0.6
4 9/16 to 5	0.8

Hammered Round and Square

Inches	**Extra per lb., Cents**
3 1/16 to 4	1.0
4 1/16 to 6	1.5
6 1/16 to 7	2.0

Hexagon

One cent extra throughout above lists.

Rolled Flat

1 in. to 3 in. wide by ⅜ in. to 1 in. thick	Base
Inches	**Extra per lb., Cents**
1 1/16 to 1 5/16 x ⅜ to ¾	0.4
1 1/16 to 1 5/16 x ¼ and 5/16	0.5
9/16 and ⅝ x ⅜ to ½	0.5
9/16 and ⅝ x ¼ and 5/16	0.7
½ x ⅜ and 7/16	0.9
½ x ¼ and 5/16	1.1
7/16 x ⅜	1.0
7/16 x ¼ and 5/16	1.2
⅜ x ¼ and 5/16	1.5

OPEN-HEARTH MACHINERY STEEL

CLASSIFICATION

Continued

HAMMERED FLAT

Sizes not in the Rolled Flat Classification will be hammered at special prices, as agreed.

HALF ROUND

Diameter, In.	½ to 9/16,	5/8 to 11/16,	¾ to 13/16,	7/8 to 2.
Cts. Ex. per lb.	0.9	0.7	0.6	0.5

CUTTING

	Extra per lb., Cents
Cutting to specified lengths over 24 inches	0.2
Cutting to specified lengths between 12 and 24 inches	0.4
Cutting to specified lengths less than 12 inches, as agreed, but not less than	0.6

PLANISHING AND STRAIGHTENING

	Extra per lb., Cents
Planishing, 5/8 inch to 2 inches	0.2
Machine-straightening, ordinary sizes	0.2
Machine-straightening and centering	0.4

QUANTITY DIFFERENTIALS

All specifications for less than 2000 pounds of a size will be subject to extras, determined by the total weight of the size ordered:

	Extra per lb., Cents
Less than 2000 pounds, but not less than 1000 pounds	0.3
Less than 1000 pounds	0.7

SUNDRY SPECIAL PRODUCTS

NORSWEDE INGOT-IRON

As a very satisfactory substitute for Norway Iron we supply under the above name a thoroughly homogeneous dead-soft, free-welding ingot-iron made of particularly pure stock. As a backing for tool-steel machine-knives, it is much in demand.

Because of its high magnetic permeability and extremely low hysteresis, it is particularly suited for the manufacture of all kinds of electro-magnets. For this purpose its magnetic properties and great uniformity render it superior to Norway Iron.

Price per pound .....Base

Subject to Classification, pages 130 and 131.

RIFLE-BARREL STEEL

In high-power rifles using smokeless powder, the barrel is subject to very severe stresses and pronounced corrosive action. Hence satisfactory rifle-barrel steel must be absolutely sound and must possess unusually high physical properties and fair resistance to corrosion. The steel must also satisfy prevailing shop requirements in the matter of easy turning, drilling and rifling and must respond uniformly and reliably to definite heat-treatment.

As experienced manufacturers of rifle-barrel steel under the rigid specifications of the Ordnance Department of the U. S. Army, we are well prepared to furnish this material to suit the demands of all users.

Price per lb.

"Smokeless powder" barrel-steel .....

"Chrome-nickel" barrel-steel .....

"Soft" barrel-steel, see page 136

PERMANENT MAGNET STEEL

Our tungsten alloy-steel for use in magnetos, electric meters, etc., combines with the highest magnetic strength and permanence, the property of being readily worked and easily hardened. The hardening is accomplished at a relatively low temperature and over a wider thermal range than is allowable for many other steels of this character. This steel is practically free from any tendency to check or warp in hardening and meets with the unqualified approval of users.

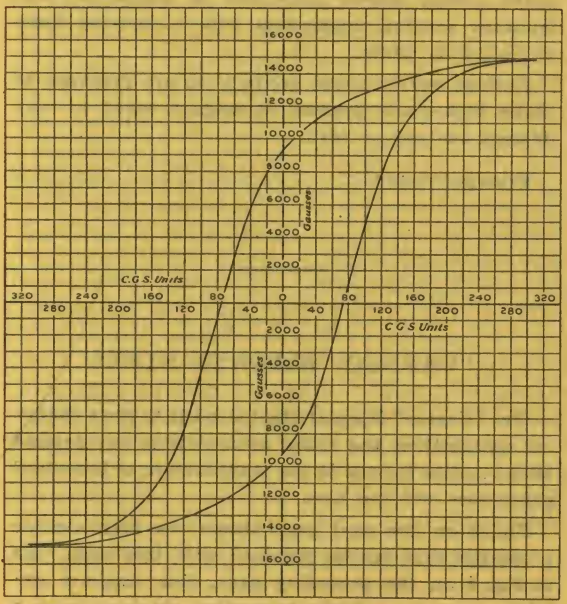


Fig. 1

Hysteresis Curve for Permanent Magnet Steel

Fig. 1 on the preceding page is a typical hysteresis diagram of our Permanent Magnet Steel, illustrating its very high residual magnetism coupled with high coercive force.

The diagram shows the average magnetic properties obtained upon a straight bar 1 x 5/16 inch x 12 inches long, tested by a modified ballistic method in an open magnetic circuit without the use of yokes. The abscissas represent magnetizing forces, while the ordinates represent the induced magnetism. The curve clearly shows properties in excess of 9000 Gausses residual magnetism with a coercive force of 70 C.G.S. Units.

Besides our standard product we are prepared to make high-grade permanent magnet steel to any desired analysis or test.

Price per pound.....

"CARSCO" MAGNET STEEL

Our "Carsco" Magnet Steel is made to close chemical specification and rolled accurately to any desired shape or size for use in the manufacture of industrial generators and the like.

Fig. 2 on the next page shows the high electric properties that can be obtained with this steel. As in Fig. 1 on the preceding page, this diagram exhibits average magnetic properties obtained upon a straight bar 1 x 5/16 inch x 12 inches long, tested by

a modified ballistic method in an open magnetic circuit without the use of yokes. The abscissas represent magnetizing forces while the induced magnetism is represented by the ordinates. In Fig. 2 the curve indicates properties of nearly 8000 Gausses residual magnetism with a coercive force of 65 C.G.S. Units.

Price per pound.....

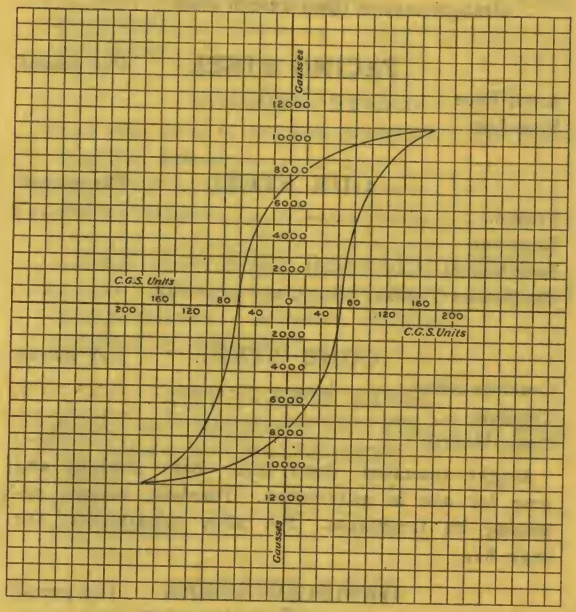


Fig. 2
Hysteresis Curve for "Carsco" Magnet Steel

PAPER MACHINERY STEEL

	Per pound
Roll-Bar: heat-treated alloy-steel	.....
straight-carbon open-hearth steel	.....
Fly-Bar: heat-treated alloy-steel	.....
straight-carbon open-hearth steel	.....
Jordan-Bar: heat-treated alloy-steel	.....
straight-carbon open-hearth steel	.....
Bed-Plate: heat-treated alloy-steel	.....
straight-carbon open-hearth steel	.....

FACING STEEL

	Per pound
Anvil-Face	.....
Vise-Jaw	.....

GUN STEEL

	Per pound
Frame	.....
Receiver	.....
Soft Barrel	.....

Smokeless-Powder barrel, see page 132

CONE STEEL

	Per pound
Crucible-Alloy	.....
Crucible	.....
Open-Hearth	.....

Bright annealed, dead soft. Bars straight and true for use in automatics. Hardens evenly, retaining its toughness. For alloy cone-steels, see page 61.

HAMMER STEEL

	Per pound
For machinists', engineers', blacksmiths' and carpenters' hammers, requiring a choice grade	.....

DRILL STEEL

Shapes: octagon, quarter-octagon, hexagon, cruciform.
Of suitable carbon-tempers for all kinds of rock.

	Base per pound
Comet	.....
Titan	.....

Subject to Tool-Steel Classification, page 64.

ROLLER STEEL

Very close to size and planished.	Per pound
Hard Roller	.....
Soft Roller	.....

SPINDLE STEEL

Rolled very close to size and planished.	Per pound
Machine Spindle	.....
Cop Spindle	.....
Mule Spindle	.....

EMERY-WHEEL DRESSER STEEL

Specially selected grade; hot-rolled, bright-annealed: acquires extreme hardness by quenching	Per pound .....

SET-SCREW STEEL

Annealed and straightened bars, either for tempering or case-hardening.	Per pound
Comet	.....
Titan	.....
Open-Hearth	.....

WEDGE STEEL

For Coal and Granite Work	Per pound
Crucible	.....
Open-Hearth	.....

FORGINGS

Superior steel forgings to sketch or blueprint in low- or high-carbon regular, special or alloy crucible and open-hearth steels

FOR

AUTOMOBILE PARTS

LATHE-SPINDLES

PISTON-RODS

PINION BLANKS

STRAIGHT SHAFTS

COLLARED SHAFTS

CRANK-PINS

FEED-SCREWS

JACK-SCREWS

HYDRAULIC-PRESS RAMS

ROCK-DRILL PISTONS

DIE-BLOCKS

DIE-BLANKS FOR TUBE DRAWING

SHEAR-KNIFE BLANKS

WELL-BITS AND JAR-STEEL

GRADING AND FINISHING ROLLS

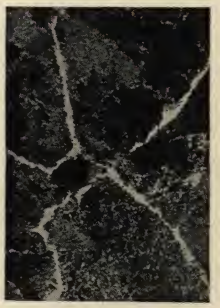
TRUNNION-BALLS, ETC., ETC.

We rough-machine, or machine and finish to blueprint, any of the above forgings and supply a finished product, ready for immediate use.

Prices on application, according to the weight, number, shape and quality of stock.

HEAT-TREATMENT OF FORGINGS

No. 1—Natural condition, not treated.



No. 2—Same steel after heat-treatment.

Physical Properties.

	No. 1	No. 2	Gain by Treatment
Elastic limit, lbs. per sq. in.	45,400	60,300	14,900
Ultimate strength, lbs. per sq. inch	75,700	86,900	11,200
Elongation in 2 ins., per cent.	18.0	23.5	5.5
Contraction of area, per cent.	45.3	60.5	15.2

ROLLS AND TRUNNION-BALLS

GRADING AND FINISHING ROLLS FOR COLD-ROLLING

We supply forged crucible-steel rolls, machined, tempered and rough-ground to customers' designs.

Our long experience and success in the manufacture of hardened rolls enables us to warrant them free from all defects of manufacture and to guarantee the hardness. See page 60.

If any defect or flaw, due to our manufacture, develops in a roll within six months of the date of shipment from our works, we will replace it free of charge.

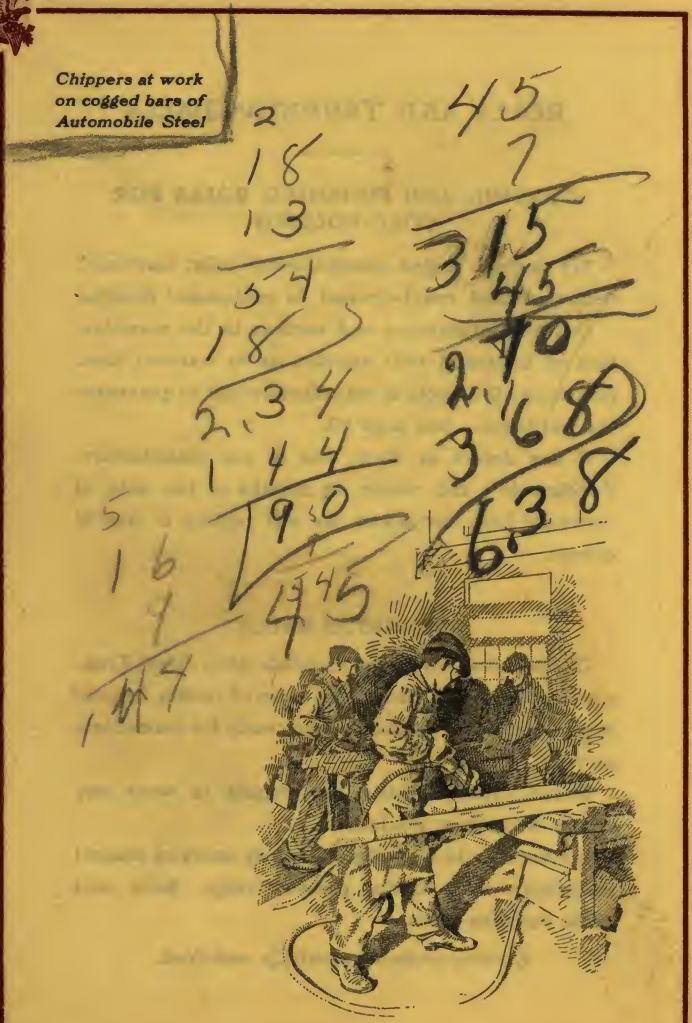
TRUNNION-BALLS

Our heat-treated forged Crucible Alloy-Steel Trunnion-Balls are supplied to the users of Griffin Cement Mills completely machined and ready for immediate service.

These Trunnion-Balls far surpass in wear any others heretofore produced.

We are also in a position to supply users of cement machinery with shafts, pressure-rings, balls and other machine-parts.

Correspondence cordially solicited.



Chippers at work on cogged bars of Automobile Steel

CARPENTER AUTOMOBILE STEELS

Our Alloy-steels for automobile construction enjoy the enviable distinction of ranking among the best of their respective kinds, either foreign or domestic. The success they have achieved is without parallel, and their adoption in this country for high-class cars has been almost universal.

The pre-eminent qualities of these steels are great tensile strength and high elastic limit, combined with extraordinary toughness and singular ability to withstand shock.

Our cold-drawn nickel, chrome-nickel and Samson steels in rounds, squares and hexagons, bright-finished, for automobile parts, machine satisfactorily and are peculiarly suited to resist shock and vibration.

Special Catalog on request.

MISCELLANEOUS STEELS

Not Elsewhere Noted

Quotations are for base sizes, subject to extras as per the classifications in this catalog.

	Per pound Base Sizes
Axle	
Backing	
Cant-Hook	
Chuck-Jaw	
Dipper-Tooth	
Eye-Pin	
Feather, or Shim	
Forcep	
Fork (agricultural)	
Furnace-Bar	
Harrow-Tooth	
Ice-Plow	
Jar-Steel	
Key	
Lock-Nut	
Nail-Puller	
Pick and Mattock	
Plane-Iron Edge Steel	
Safety-Tread	
Screw-Driver	
Scythe	
Shank Steel	
Skate-Runner	
Sledge	
Toe-Calk (hard-center)	
Trap Spring	
Trowel	
Washer	
Well-Bit	

CARPENTER CHROME-NICKEL STEEL CASTINGS

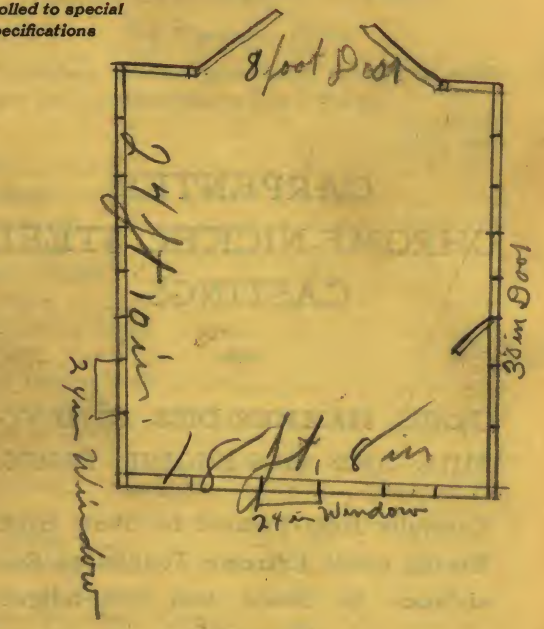
FOR

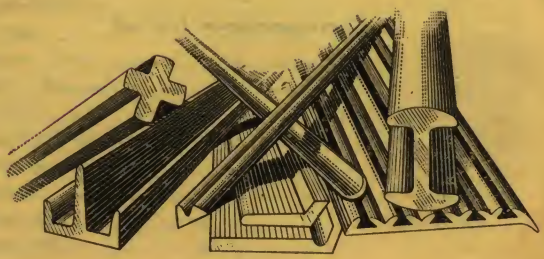
GEARS, HAMMER-DIES, CEMENT-MILL AND GAS-ENGINE PARTS.

Carefully Heat-Treated to Show High Elastic Limit, Extreme Toughness, Resistance to Shock and Anti-fatigue Properties.

Correspondence Invited

Odd Shapes
hot-rolled to special
specifications





25 - 2 x 4 = 7 food.

9
7
63

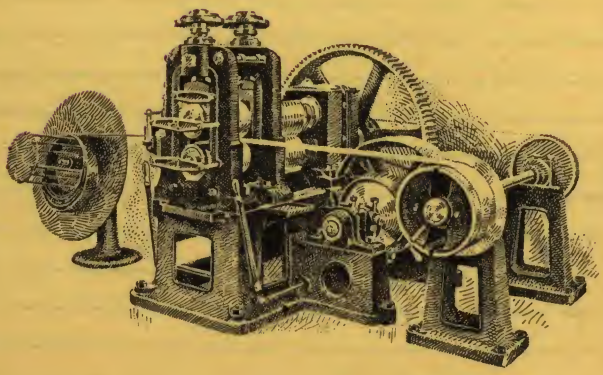
40

3
115
63
345
690
72.45

78.75
1654
1 6 5 4
63
125
2.21
2.50
6 3 00
7 0
10.0
5

72 45
6 30
78.75
20
0000
50
157
200
79
1654

Cold-rolling high grade
Motor Spring-Steel



COLD-ROLLED AND DRAWN STEEL SPECIALTIES

LEADING PRODUCTS

FLAT

Safety-Razor Steel, Hack-Saw
Band-Saw and Butcher-Saw Steel

Motor-Spring Steel, Truss-
Lock- and Clock-Spring Steel

Heddle-Wire, Tape-Line and Rule Steel

Extra Dead-Soft Drawing and Stamping Steel

ROUND AND SQUARE

Die-Drawn Tool-Steel
Tap and Die Steel, Nail-Set
and Screw-Driver Steel

Dental Instrument Steel
Drill-Rod, Needle and Pile
Wire, Screw- Pivot- and all
Special Watch-Wire

Spectacle Wire, Round and Flat
Electrical Resistance-Wire

B-Block, Side-Link and Other Special
Chain-Steels, Minor Gun-Parts Steel

We are well equipped for drawing unusual and difficult shapes to meet special requirements.

COLD-ROLLED STRIP-STEEL

Manufactured in

CRUCIBLE, SELECTED OPEN-HEARTH AND SPECIAL ALLOY-STEEL GRADES

Thickness from .005 inch to .250 inch.
Width from .125 inch to 6.00 inches.

Our Cold-Rolled Strip-Steel is supplied either cut to length or in coils for purposes where very high and uniform quality is the first consideration, such as for

SPRING STEEL, BAND-, BUTCHER- AND HACK-SAW STEEL, DEAD-SOFT STAMPING AND DRAWING-STEEL, ETC.

The steel can be finished either bright, or annealed, or bright-annealed up to 6.00 inches wide; and tempered, polished, strawed or blued up to 3.50 inches wide and .125 inch thick.

Our Extra Dead-Soft Drawing-Steel is specially suited for making drawn, stamped or pressed pieces of intricate and complex design.

New uses are constantly being found for cold-rolled strip-steel of extra high quality. A new shape, or a change in the form of dies or in automatic machinery, may call for a steel specially adapted to meet the new conditions. We aim to supply satisfactory material for just such cases by familiarizing ourselves with our customers' most particular needs.

QUOTATIONS

The price is customarily made on strip-steel to be shipped in bundles or coils—boxing, barreling or wrapping being charged at a reasonable extra. All quotations are based on delivery, f. o. b. cars at our works, Reading, Pa.

How to Order
Cold Rolled Strip-Steel and Flat Wire

When sending us your inquiries for cold-rolled steel or flat wire, please state your requirements as to:

1—Quantity.

2—Width, in inches and decimals of an inch.

3—Thickness, in thousandths of an inch. Is it to be measured at the edge or middle of the strip?

If the thickness is given by gauge-number, use Birmingham wire-gauge. If any other gauge is used, state which it is.

4—Tolerances: allowable variation in width and thickness, above and below the given size, expressed in thousandths of an inch. If a variation is allowable in one way only, state whether the strip may be

a, wider but not narrower } than the width
b, narrower but not wider } specified; or
c, thicker but not thinner } than the thick-
d, thinner but not thicker } ness specified.

Unless otherwise specified we work to the following tolerances for thickness in strip-steel and flat wire of all thicknesses:

Width of Strip	Tolerance for Thickness
From ⅛″ to ¾″	.00025 plus and .00025 minus
Above ¾″ to 1½″	.001 " " .001 "
" 1½″ to 3″	.0015 " " .0015 "
" 3″ to 6″	.002 " " .002 "

5—Minimum and maximum lengths of strips, or weights of coils.

6—Whether one or both edges must be round or square. If possible, leave this to our option so as to facilitate prompt execution.

7—Purpose for which the steel is to be used.

8—Condition and surface finish:

a, Hard, half-hard or quarter-hard;

b, Bright-annealed or dark-annealed;

c, Black-tempered;

d, Tempered and polished—bright, blued or strawed. When practical, send us a sample six to ten inches long, of the steel desired, or a sample of the finished article to show your requirements.

9—Shipping: Whether you wish the goods boxed.

Unless otherwise instructed by our customers, we ship all unpolished cold-rolled strip-steel in 10-foot to 12-foot lengths and will include the end-pieces, left over in cutting to length, except when by special agreement the ends are to be discarded by us.

COLD-ROLLED STEEL AND FLAT WIRE
IN COILS AND STRIPS

PRICE LIST

Width in Inches		THICKNESS Birmingham Gauge	THICKNESS Decimals of One Inch	Price in dollars and cents per pound: Untempered	Black Tempered	Tempered and Polished	Tempered, Polished and Strawed
	x	16	.0659	.50	.61	.66	.69
	x	17, 18	.058, .049	.51	.62	.67	.70
	x	19	.042	.52	.63	.68	.71
	x	20, 21, 22	.035, .032, .028	.53	.64	.69	.72
1/8	x	23, 24	.025, .022	.55	.66	.71	.74
to	x	26	.018	.60	.73	.79	.82
3/16	x	27	.016	.65	.81	.87	.90
	x	30	.012	.72	.87	.92	.95
	x	32	.009	.82	1.00	1.06	1.09
	x	34	.007	.96	1.17	1.23	1.26
	x	35	.005	1.14	1.37	1.43	1.46
	x	16	.0659	.48	.60	.65	.68
	x	17, 18	.058, .049	.49	.61	.66	.69
	x	19	.042	.50	.62	.67	.70
	x	20, 21, 22	.035, .032, .028	.51	.63	.68	.71
1/4	x	23, 24	.025, .022	.53	.65	.70	.73
to	x	26	.018	.60	.74	.79	.82
1/2	x	27	.016	.68	.84	.89	.92
	x	30	.012	.72	.87	.92	.95
	x	32	.009	.78	.97	1.02	1.05
	x	34	.007	.85	1.08	1.13	1.16
	x	35	.005	.94	1.21	1.27	1.30

Continued

COLD-ROLLED STEEL AND FLAT WIRE

IN COILS AND STRIPS

PRICE LIST—Continued

Width in Inches		THICKNESS: Birmingham Gauge	THICKNESS: Decimals of One Inch	Price in dollars and cents per pound: Untempered	Black Tempered	Tempered and Polished	Tempered, Polished and Strawed
9/16 to 1¼	x	16	.0659	.47	.59	.64	67
	x	17, 18	.058, .049	.48	.60	.65	.68
	x	19	.042	.49	.61	.66	.69
	x	20, 21, 22	.035, .032, .028	.50	.62	.67	.70
	x	23, 24	.025, .022	.52	.64	.69	.72
	x	26	.018	.59	.73	.78	.81
	x	27	.016	.67	.83	.88	.91
	x	30	.012	.71	.86	.92	.95
	x	32	.009	.76	.95	1.01	1.04
	x	34	.007	.82	1.05	1.11	1.14
	x	35	.005	.88	1.16	1.22	1.25
1 5/16 to 2½	x	16	.0659	.45	.57	.62	.65
	x	17, 18	.058, .049	.46	.58	.63	.66
	x	19	.042	.47	.59	.64	.67
	x	20, 21, 22	.035, .032, .028	.48	.60	.65	.68
	x	23, 24	.025, .022	.50	.62	.67	70
	x	26	.018	.53	.71	.77	.80
	x	27	.016	.64	.80	.86	.89
	x	30	.012	.69	.85	90	.93
	x	32	.009	.76	.95	1.01	1.04
	x	34	.007	.84	1.07	1.13	1.16
	x	35	.005	.95	1.22	1.27	1.30

Continued

COLD-ROLLED STEEL AND FLAT WIRE

IN COILS AND STRIPS

PRICE LIST—Continued

Width in Inches		THICKNESS: Birmingham Gauge	THICKNESS: Decimals of One Inch	Price in dollars and cents per pound: Untempered	Black Tempered	Tempered and Polished	Tempered, Polished and Strawed
2 9/16 to 3½	x	16	.0659	.44	.56	.61	.64
	x	17, 18	.058, .049	.45	.57	.62	.65
	x	19	.042	.46	.58	.63	.66
	x	20, 21, 22	.035, .032, .028	.47	.59	.64	.67
	x	23, 24	.025, .022	.49	.61	.66	.69
	x	26	.018	.51	.70	.76	.79
	x	27	.016	.64	.80	.86	.89
	x	30	.012	.69	.85	.90	.93
	x	32	.009	.76	.95	1.01	1.04
	x	34	.007	.84	1.07	1.13	1.16
	x	35	.005	.95	1.22	1.27	1.30

Base, .0659 inch (16 B.W.G.) and thicker.

For wider and heavier sizes than above, up to 6.00 x .250 inches, prices on application.

DISCOUNT on 2000 pounds or more of one size:

Alloy-Crucible.....

Extra Crucible.....

Crucible.....

Special Open-Hearth.....

EXTRAS for less than 2000 pounds of one size on application.

NOTE

Our tempered crucible spring-steel for the motor-springs of talking-machines, phonographs, etc., is made to rigid tests and guaranteed to give entire satisfaction.

CARPENTER SAFETY-RAZOR STEEL

We have developed with conspicuous success and furnish in large quantities the very finest grade of tempered and polished safety-razor steel. By manufacturers of safety-razors this steel is pronounced by far the most satisfactory of any on the market, being absolutely uniform in temper, straight, true to gauge and highly finished.

PRICE LIST

Size		Price per pound		Size		Price per pound	
		Soft	Tempered and Polished			Soft	Tempered and Polished
¼" to ½"	x.006	$1.20	$1.96	9/16" to 1¼"	x.010	$0.96	$1.53
	x.007	1.09	1.76		x.011	.94	1.50
	x.008	1.05	1.69		x.012	.93	1.47
	x.009	1.01	1.61				
	x.010	.98	1.54				
	x.011	.97	1.51	1 5/16" to 2"	x.006	1.27	2.01
	x.012	.96	1.48		x.007	1.14	1.81
9/16" to 1¼"	x.006	1.12	1.86		x.008	1.08	1.72
	x.007	1.05	1.68		x.009	1.03	1.64
	x.008	1.02	1.63		x.010	.99	1.56
	x.009	.99	1.59		x.011	.97	1.53
					x.012	.95	1.49

DISCOUNT:

Soft.....

Tempered and polished.....

EXTRAS for less than 500 pounds.....

" " " " 200 " .....

" " " " 100 " .....

An extra will be charged for tempering and polishing steel of our manufacture that is punched or slotted by customers. The price will depend on the shape and condition of the holes and will be furnished on application.

COLD-DRAWN BAR STEEL

Supplied in any grade but more especially in our high-quality crucible and crucible-alloy steels, in all sizes from .1875 (3/16) inch to 3 inches diameter in rounds and in corresponding sizes of squares, flats, hexagons and special shapes.

Sizes above 3 inches round will be supplied machined.

Attention is particularly invited to our Die-Drawn Tool-Steel, furnished at a moderate advance over the prices of hot-rolled or hammered bars, which finds very useful application wherever close size is necessary or advantageous. Orders for special sizes should be in fair quantities of a size to allow for the extra cost of dies.

Cold-Drawn Crucible and Special Open-Hearth Steels and Cold-Drawn Alloy-Steels are regularly furnished either in their natural condition, or heat-treated to show definite and guaranteed physical properties. In all cases the machining qualities of the steel are carefully kept in view, to insure a satisfactory output on automatics.

For Price List and Discounts see pages 179 and 180.

Our special Catalog describing in detail our heat-treated and cold-drawn Alloy-Steels will be furnished on application.

Correspondence is cordially solicited.

ROUND COLD-DRAWN BAR STEEL

PRICE LIST

NATURAL FINISH

Weights given are for Straight-Carbon Steel

Diameter		Wt. per ft. lbs.	Price per lb. cents	Diameter		Wt. per ft. lbs.	Price per lb. cents
In.	MM.			In.	MM.		
3	76.199	24.05		1 1/32	26.194	2.85	
2 7/8	73.024	22.09		1	25.400	2.68	
2 3/4	69.849	20.21		31/32	24.606	2.52	
2 5/8	66.674	18.41		15/16	23.812	2.35	
2 1/2	63.499	16.70	46	59/64	23.416	2.27	
2 3/8	60.324	15.07		29/32	23.019	2.20	
2 1/4	57.149	13.52		7/8	22.225	2.05	
2 1/8	53.974	12.07		27/32	21.431	1.94	
2 1/16	52.388	11.35		53/64	21.035	1.90	
2	50.799	10.69		13/16	20.638	1.77	
1 15/16	49.212	10.03		51/64	20.241	1.68	41
1 7/8	47.624	9.39		25/32	19.844	1.59	
1 27/32	46.831	9.10		3/4	19.050	1.50	
1 13/16	46.037	8.78		47/64	18.653	1.43	
1 3/4	44.449	8.18		23/32	18.256	1.38	
1 11/16	42.862	7.61		11/16	17.462	1.26	
1 5/8	41.274	7.06		43/64	17.066	1.22	
1 9/16	39.687	6.52		21/32	16.669	1.17	
1 1/2	38.099	6.01		41/64	16.272	1.11	
1 15/32	37.306	5.60		5/8	15.875	1.05	
1 7/16	36.512	5.52		19/32	15.081	1.00	
1 13/32	35.718	5.26	41	9/16	14.287	.845	
1 3/8	34.924	5.05		17/32	13.494	.757	43
1 5/16	33.337	4.61		1/2	12.700	.667	
1 9/32	32.543	4.40		15/32	11.806	.586	
1 1/4	31.749	4.17		7/16	11.112	.511	
1 7/32	30.956	4.02		13/32	10.318	.450	46
1 3/16	30.162	3.77		3/8	9.524	.375	
1 5/32	29.368	3.58		11/32	8.731	.320	
1 1/8	28.574	3.38		5/16	7.937	.260	50
1 3/32	27.781	3.20		1/4	6.350	.167	
1 5/64	27.384	3.11		7/32	5.556	.130	54
1 1/16	26.987	3.02		3/16	4.762	.095	58

Continued

ROUND COLD-DRAWN BAR STEEL

PRICE LIST—Continued

DISCOUNT on 500 pounds or more of one size:

Alloy-Crucible .....
Extra Crucible .....
Crucible.....
Special Open-Hearth .....

EXTRAS for less than 500 pounds of one size on application.

SHAPE EXTRAS

Square and Hexagon shapes, 1 cent per pound net extra.

Flats, net extra furnished on application.

CUTTING TO SPECIFIED LENGTHS

24 inches and over ..... ½ cent per lb. net extra
18 to 23⅞ inches.....1 " " " " "
12 " 17⅞ " .....1½ " " " " "
6 " 11⅞ " .....2 cents " " " "
3 " 5⅞ " .....3 " " " " "

Less than 3 inches, Special Price

BOXING

Boxing at cost. Unless otherwise ordered we box all shipments which in our judgment require it.

NOTE

See page 22 for extra freight-charges on lengths exceeding 22 feet.

WIRE SPECIALTIES

Manufactured in

CRUCIBLE, SELECTED OPEN-HEARTH AND SPECIAL ALLOY-STEEL GRADES

We make a specialty of high-grade products such as needle-wire, electrical resistance wire and resistance tape, rule-tape, heddle- watch- and pile-wire: furnished untempered, black-tempered, polished or colored, as ordered.

All quotations are made for delivery f. o. b. cars at our works, Reading, Pa. For boxing, barreling and wrapping a reasonable extra will be charged.

FLAT STEEL WIRE

FOR

SASH-BALANCE, RULE-TAPE, HEDDLE-WIRE, ETC.

Sizes from .005 to .125 inch thick and from .125 inch to 3.50 inches wide can be supplied in coils. Thicker and wider sizes of flat wire are furnished only in straight strips.

The suggestions given on pages 172 and 173 to facilitate customers' inquiries and govern their orders should be followed as closely as possible.

For Price List, refer to pages 174–176.

ROUND STEEL WIRE

FOR

SPRINGS, SCREW-DRIVERS, WATCH-SCREWS AND PINIONS, BALANCE-STAFFS, ETC.

Sizes from .018 inch to .750 inch diameter can be supplied in coils, as per Price List on page 182. Larger rounds are furnished only in bars; see pages 179-180.

Round Steel Wire

Price List

for wire in coils

SIZE		Price Per Lb.	SIZE		Price Per Lb.
Inch or Gauge	Decimal of an Inch		B.W.G	Dec. Inch	
¾ to ⅝	.750 to .525	.40½	16	.065	$0.61
19/32 to ½	.593 to .500	.42½	17	.058	.63
15/32 to ⅜	.454 to .375	.45½	18	.049	.66
11/32 to 5/16	.343 to .312	.49½	19	.042	.75
¼ to 7/32	.250 to .218	53½	20	.035	.86
6 to 7 B.W.G.	.203 to .180	.57½	21	.032	1.06
8 to 11 "	.165 to .120	.58	22	.028	1.22
12 "	.109	.58½	23	.025	1.38
13 "	.095	.59	24	.022	1.75
14 "	.083	.59½	25	.020	2.12
15 "	.072	.60½	26	.018	2.84

Discount for 500 pounds of one size:

Alloy-Crucible.....

Crucible.....

Open-Hearth.....

Extras for less than 500 pounds of one size on request.

List for Straightening and Cutting

¾-inch to ⅜-inch diameter.....½ cent per pound.
11/32-inch to 7/32-inch diameter.....¾ cent per pound.

B.W.G. Nos.	6 to 7	8 to 11	12 to 14	15 to 20	21 to 26
Cts. per lb.	1	1½	2½	On application	

Straightening and Cutting Classification

Twenty inches or longer, 50 per cent. off list; 10 to 20 inches long, 25 per cent. off list; 5 to10 inches long, net list; 3 to 5 inches long, add 25 per cent. to list; 1 to 3 inches long, add 50 per cent. to list.

TOOL-STEEL NEEDLE-WIRE

FOR

LATCH-, HOSIERY- AND SEWING-MACHINE NEEDLES, AWLS, ETC.

PRICE LIST IN COILS

B.W.G.	Decimal of an Inch	Price per lb.	B.W.G.	Decimal of an Inch	Price per lb.
1–11	....	$0.41	..	.039	$0.65
12	.109	.44	20	.035	.65
..	.105	.44	..	.0335	.70
13	.095	.47	21	.032	.70
..	.0925	.47	..	.0315	.70
14	.083	.49	..	.030	.76
..	.080	.49	..	.029	.76
..	.077	.50	22	.028	.82
15	.072	.50	..	.026	.82
..	.068	.53	23	.025	.88
16	.065	.53	..	.023	.88
..	.064	.53	24	.022	.97
17	.058	.56	..	.021	.97
..	.054	.56	25	.020	1.05
..	.052	.59	..	.019	1.05
18	.049	.59	26	.018	1.20
..	.0475	.59	..	.017	1.20
..	.044	.62	27	.016	1.50
19	.042	.62	..	.015	1.50
..	.0415	.62	..	....	....

DISCOUNT.....

CARPENTER "517" ELECTRICAL RESISTANCE WIRE

We supply both high- and low-resistance metal in either round or flat wire.

Carpenter "517" resistance-metal excels in its high specific resistance, low temperature-coefficient and permanence of electrical properties.

When asking for prices, please state the quantity and the size of wire wanted, preferably expressing the diameter in thousandths of an inch.

If you specify by gauge-numbers, state whether Brown & Sharpe Gauge or Birmingham Wire Gauge is meant.

Mean specific resistance of Carpenter "517" Resistance Wire is 85 microhms per cubic centimeter at 20° C. (68° F.)

Specific gravity is 8.0195.

Temperature-coefficient (or change of resistance with change of temperature) is insignificant, being .0003 per 1° C. (.0002 per 1° F.).

Melting-point is above 1100° C. (2012° F.) which is a very light yellow, approaching white heat.

The international ohms-per-foot given in following table are calculated at 20° C. (68° F.).

The international ohm is the resistance of one square mm. of mercury 106.3 cm. long at 0° C. It was made the legal unit of resistance in the United States by Act of Congress, 12 July, 1894.

CARPENTER "517"

ELECTRICAL RESISTANCE WIRE TABLE

B. & S. Gauge	Diameter		Feet		Ohms per Foot	Price per lb.
	Inches	Milli-meters	Per Pound	Per Ohm		
10	.1019	2.588	34.78	19.65	.0509	$1.15
11	.0907	2.304	43.84	15.55	.0643	1.15
12	.0808	2.052	55.28	12.36	.0809	1.15
13	.0720	1.829	69.72	9.804	.1020	1.20
14	.0641	1.628	87.9	7.758	.1289	1.20
15	.0571	1.450	110.8	6.165	.1622	1.20
16	.0508	1.200	139.8	4.892	.2044	1.25
17	.0453	1.151	176.3	3.883	.2575	1.25
18	.0403	1.024	222.3	3.074	.3254	1.30
19	.0359	.9118	280.3	2.371	.4217	1.30
20	.0320	.8128	353.6	1.942	.5150	1.30
21	.0285	.7238	445.6	1.529	.6540	1.35
22	.0254	.6452	562.0	1.2140	.824	1.35
23	.0226	.5740	708.5	.9662	1.035	1.35
24	.0201	.5105	893.6	.7645	1.308	1.40
25	.0179	.4547	1127.0	.6068	1.648	1.40
26	.0159	.4038	1421.	.4805	2.081	1.40
27	.0142	.3607	1792.	.3807	2.627	1.50
28	.0126	.3200	2259.	.3006	3.327	1.60
29	.0113	.2870	2849.	.2397	4.172	1.70
30	.0100	.2540	3592.	.1904	5.253	1.85

DISCOUNT.....

CARPENTER BRIGHT-POLISHED TOOL-STEEL DRILL RODS

FOR

TAPS, REAMERS, TWIST-DRILLS, DENTAL INSTRUMENTS, WATCH AND TYPEWRITER PARTS, ELECTRICAL WORK, ETC.

For quality of temper, accuracy of size and brightness of finish, these rods are guaranteed equal to the very best foreign and domestic rods of corresponding grade, and far superior to the majority of drill-rods on the market. Comparisons are invited.

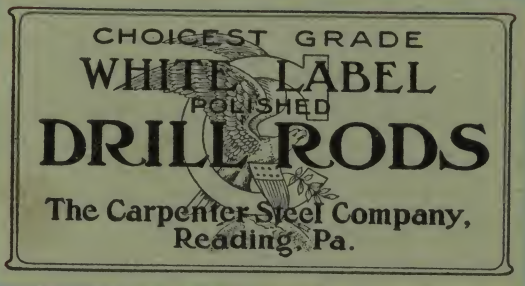
All regular sizes are carried in stock in 3-foot lengths, and are guaranteed true to within half a thousandth of an inch (.0005) plus and minus.

On pages 188-197 our round drill-rods are listed according to Stub's Steel Wire or Drill-Rod Gauge.

For discounts from list, see page 197.

Intermediate sizes and special lengths not listed, will be furnished in lots of not less than 100 pounds of a size at special prices that will be quoted on application.

CARPENTER DRILL RODS
ARE FURNISHED IN TWO GRADES:



WHITE LABEL
MADE OF OUR EXTRA TOOL-STEEL.

GREEN LABEL
MADE OF OUR COMET TOOL-STEEL.

All sizes in Chicago Stock

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS

Sizes, Weights and Prices

SIZE			WEIGHT		Price per Pound
No. Drill-Rod Gauge	Inch and Decimal	Inch and Nearest Equivalent Fraction	Pounds per 100 Feet	Foot per Pound	
....	1.500	1 1/2	600.38	.1665	$0.50
....	1.4843	1 31/64	587.91	.1701	.50
....	1.4687	1 15/32	575.61	.1737	.50
....	1.4531	1 29/64	563.45	.1775	.50
....	1.4375	1 7/16	551.42	.1813	.50
....	1.4218	1 27/64	539.43	.1854	.50
....	1.4062	1 13/32	527.64	.1895	.50
....	1.3906	1 25/64	516.02	.1938	.50
....	1.375	1 3/8	504.50	.1982	.50
....	1.3593	1 23/64	493.05	.2028	.50
....	1.3437	1 11/32	481.81	.2076	.50
....	1.3281	1 21/64	470.66	.2125	.50
....	1.3125	1 5/16	459.69	.2175	.50
....	1.2968	1 19/64	448.75	.2228	.50
....	1.2812	1 9/32	438.01	.2283	.50
....	1.2656	1 17/64	427.41	.2340	.50
....	1.250	1 1/4	416.95	.2398	.50
....	1.2343	1 15/64	406.55	.2460	.50
....	1.2187	1 7/32	396.33	.2523	.50
....	1.2031	1 13/64	386.23	.2589	.50

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price
No. Drill-Rod Gauge	Inch and Decimal	Inch and Nearest Equivalent Fraction	Pounds per 100 Feet	Foot per Pound	per Pound
....	1.1875	1 3/16	376.28	.2658	$0.50
....	1.1718	1 11/64	366.39	.2729	.50
....	1.1562	1 5/32	356.71	.2803	.50
....	1.1406	1 9/64	347.16	.2881	.50
....	1.125	1 1/8	337.72	.2961	.50
....	1.1093	1 7/64	328.37	.3045	.50
....	1.093	1 3/32	318.79	.3137	.50
....	1.078	1 5/64	310.10	.3225	.50
....	1.062	1 1/16	301.23	.3320	.50
....	1.046	1 3/64	291.95	.3425	.50
....	1.031	1 1/32	283.63	.3526	.50
....	1.015	1 1/64	274.90	.3638	.50
....	1.	1	266.84	.3748	.50
....	0.984	63/64	258.37	.3870	.50
....	0.969	31/32	250.43	.3993	.50
....	0.953	61/64	242.35	.4126	.50
....	0.937	15/16	234.53	.4264	.50
....	0.921	59/64	226.35	.4418	.50
....	0.906	29/32	219.16	.4563	.50
....	0.890	57/64	211.37	.4731	.50

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price per Pound
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Foot per Pound	
....	0.875	7/8	204.30	.4895	$0.50
....	0.859	55/64	196.90	.5079	.50
....	0.844	27/32	189.97	.5264	.50
....	0.828	53/64	182.95	.5466	.50
....	0.812	13/16	176.16	.5677	.50
....	0.796	51/64	169.08	.5914	.50
....	0.781	25/32	162.87	.6140	.50
....	0.765	49/64	156.17	.6403	.50
....	0.750	3/4	150.10	.6662	.55
....	0.734	47/64	143.76	.6956	.55
....	0.719	23/32	137.85	.7254	.55
....	0.703	45/64	131.88	.7583	.55
....	0.687	11/16	126.12	.7929	.55
....	0.671	43/64	120.14	.8324	.55
....	0.656	21/32	114.92	.8702	.55
....	0.640	41/64	109.30	.9149	.55
....	0.625	5/8	104.24	.9593	.55
....	0.609	39/64	98.97	1.0104	.55
....	0.594	19/32	94.07	1.0630	.55
....	0.578	37/64	89.15	1.1217	.55

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price per Pound
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	
....	0.562	9/16	84.43	1.184	$0.55
....	0.546	35/64	79.26	1.262	.55
....	0.531	17/32	75.31	1.328	.55
....	0.515	33/64	70.77	1.413	.55
....	0.500	1/2	66.71	1.499	.60
....	0.484	31/64	62.51	1.600	.60
....	0.469	15/32	58.63	1.706	.60
....	0.453	29/64	54.76	1.826	.60
....	0.437	7/16	51.08	1.958	.60
....	0.425		48.20	2.074	.75
....	0.421	27/64	47.30	2.114	.75
Z	0.413		45.51	2.197	.75
	0.406	13/32	44.04	2.271	.75
Y	0.404		43.55	2.296	.75
X	0.397		42.06	2.378	.75
	0.391	25/64	40.79	2.452	.75
W	0.386		39.76	2.515	.75
V	0.377		37.93	2.636	.75
	0.375	3/8	37.53	2.665	.75
U	0.368		36.14	2.767	.75

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	per Pound
	0.359	23/64	34.39	2.907	$0.75
T	0.358		34.20	2.924	.75
S	0.348		32.32	3.094	.75
	0.344	11/32	31.53	3.172	.75
R	0.339		30.67	3.261	.75
Q	0.332		29.41	3.400	.75
	0.328	21/64	28.71	3.483	.75
P	0.323		27.84	3.592	.75
O	0.316		26.65	3.752	.75
	0.312	5/16	26.06	3.837	.75
	0.302		24.34	4.109	.75
N	0.297	19/64	23.54	4.245	.75
M	0.295		23.22	4.307	.75
L	0.290		22.44	4.456	.75
K	0.281	9/32	21.11	4.737	.75
J	0.277		20.47	4.885	.75
I	0.272		19.74	5.066	.75
H	0.266	17/64	18.88	5.297	.75
G	0.261		18.18	5.501	.75
F	0.257		17.62	5.675	.75

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	per Pound
E	0.250	¼	16.68	5.995	$0.75
D	0.246		16.15	6.192	.75
C	0.242		15.63	6 398	.75
B	0.238		15.12	6.614	.75
A	0.234	15/64	14.61	6.845	.75
1	0.227		13.75	7.273	.75
2	0.219	7/32	12.77	7.831	.75
3	0.212		11.99	8.340	.75
4	0.207		11.43	8.749	.75
5	0.204		11.11	9.001	.75
	0.203	13/64	11.00	9.091	.75
6	0.201		10.78	9.276	.75
7	0.199		10.57	9.461	.75
8	0.197		10.36	9.653	.75
9	0.194		10.04	9.960	.75
10	0.191		9.73	10.278	.75
11	0.188	3/16	9.38	10.661	.75
12	0.185		9.13	10.953	.75
13	0.182		8.84	11.312	.75
14	0.180		8.65	11.561	75

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price per Pound
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	
15	0.178		8.453	11.830	$0.75
16	0.175		8.171	12.238	.83
17	0.172	11/64	7.896	12.665	.83
18	0.168		7.532	13.277	.83
19	0.164		7.176	13.935	.83
20	0.161		6.917	14.457	.83
21	0.157		6.577	15.205	.83
	0.156	5/32	6.513	15.354	.83
22	0.155		6.411	15.598	.83
23	0.153		6.248	16.055	.83
24	0.151		6.085	16.434	.83
25	0.148		5.843	17.115	.83
26	0.146		5.687	17.584	.83
27	0.143		5.456	18.328	.83
	0.141	9/64	5.303	18.857	.83
28	0.139		5.154	19.402	.83
29	0.134		4.791	20.873	.83
30	0.127		4.305	23.229	.83
	0.125	1/8	4.169	23.987	.83
31	0.120		3.843	26.021	.90

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	per Pound
32	0.115		3.530	28.329	$0.90
33	0.112		3.347	29.878	.90
34	0.110		3.229	30.969	.90
	0.109	7/64	3.170	31.546	.90
35	0.108		3.112	32.134	.90
36	0.106		2.998	33.356	.90
37	0.103		2.831	35.323	.90
38	0.101		2.722	36.738	.90
39	0.099		2.616	38.226	1.05
40	0.097		2.511	39.825	1.05
41	0.095		2.4083	41.523	1.05
	0.094	3/32	2.3579	42.411	1.05
42	0.092		2.2588	44.271	1.05
43	0.088		2.0662	48.398	1.05
44	0.085		1.9281	51.864	1.05
45	0.081		1.7509	57.114	1.05
46	0.079		1.6654	60.046	1.05
	0.078	5/64	1.6235	61.595	1.05
47	0.077		1.5821	63.207	1.20
48	0.075		1.5011	66.618	1.20

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price per Pound
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	
49	0.072		1.3834	72.286	$1.20
50	0.069		1.2704	78.715	1.20
51	0.066		1.1622	86.044	1.45
52	0.063		1.0589	94.437	1.45
	0.0625	1/16	1.0425	95.923	1.45
53	0.058		.8975	111.421	1.45
54	0.055		.8072	123.885	1.45
55	0.050		.6673	149.858	1.80
	0.0468	3/64	.5847	171.028	1.80
56	0.045		.5402	185.117	1.80
57	0.042		.4706	212.495	1.80
58	0.041		.4485	222.965	2.10
59	0.040		.4270	234.192	2.10
60	0.039		.4060	246.305	2.10
61	0.038		.3853	259.538	2.40
62	0.037		.3652	273.823	2.40
63	0.036		.3460	289.017	2.70
64	0.035		.3267	306.091	2.70
65	0.033		.2905	344.234	2.70
66	0.032		.2732	366.032	3.00

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

ROUND BRIGHT POLISHED TOOL-STEEL DRILL-RODS—Continued

Sizes, Weights and Prices

SIZE			WEIGHT		Price
No. Drill-Rod Gauge	Decimal of an Inch	Nearest Equivalent Fraction	Pounds per 100 Feet	Feet per Pound	per Pound
67	0.031	1/32	.2565	389.86	$3.00
68	0.030		.2402	416.32	3.00
69	0.029		.2246	445.24	3.30
70	0.027		.1947	513.61	3.30
71	0.026		.1804	554.32	3.60
72	0.024		.1536	651.04	3.60
73	0.023		.1410	709.22	3.60
74	0.022		.1291	774.59	3.90
75	0.020		.1067	937.21	4.05
76	0.018		.0863	1158.75	4.20
77	0.016	1/64	.0683	1464.13	4.50
78	0.015		.0601	1663.89	4.80
79	0.014		.0523	1912.05	5.10
80	0.013		.0452	2212.39	5.40

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

DISCOUNT:

White Label .....

Green Label.....

SQUARE POLISHED TOOL-STEEL DRILL-RODS

Sizes, Weights and Prices

SIZE		Feet Per Pound	Price Per Pound
Decimal of an Inch	Nearest Equivalent Fraction		
0.500	1/2	1.1773	$1.60
0.4687	15/32	1.3398	1.60
0.4375	7/16	1.5377	1.60
0.4062	13/32	1.7838	1.60
0.375	3/8	2.0930	1.60
0.344	11/32	2.4872	1.60
0.3125	5/16	3.0139	1.60
0.281	9/32	3.7275	1.60
0.250	1/4	4.7093	1.60
0.219	7/32	6.1370	1.60
0.1875	3/16	8.3721	1.60
0.156	5/32	12.0945	1.60
0.125	1/8	20.4750	1.60
0.094	3/32	33.3111	1.60
0.062	1/16	76.5638	1.60

Stock lengths 3 feet. Special lengths and intermediate sizes furnished to order in not less than 100-pound lots of a size.

DISCOUNT:

White Label.....

Green Label.....

A few of the special
Cold-drawn Shapes
we manufacture

STANDARD TABLES
AND
USEFUL INFORMATION

WEIGHT OF STEEL

BARS

For hot-worked steel of .50 per cent. carbon:

One cubic inch weighs 0.2833 pound.
One cubic foot weighs 489.6 pounds.
Specific Gravity.....7.854

For Star-Zenith high-speed steel, add 10 per cent.

The tables of weights for hot worked straight-carbon bar steel on pages 211-222 are calculated from the unit, 1 cubic inch=0.2833 pound or its equivalent, 1 cubic foot=489.54 pounds. A convenient unit much used in practice is 1 cubic inch=0.3 pound, which gives weights about 6 per cent. heavier than those in the tables. Since bar-steel is usually furnished slightly full to size, weights calculated on this approximate basis yield fairly close working results for all except very large sizes.

STRIPS AND WIRE

Cold-rolled and drawn steel weighs slightly less than hot-rolled or hammered steel: 1 cubic inch weighs 0.28313 pound. Specific gravity, 7.848.

To figure approximately the weight of Cold-Rolled Steel or Flat Wires:

Divide the thickness, in thousandths of an inch, by 300; the quotient will be the weight per foot of a strip 1 inch wide. Or divide by 25; the quotient will be the weight of one square foot.

EXAMPLES

Thickness of strip in thousandths, 120
divided by 300=0.4 pound per foot for a 1-inch strip;
divided by 25=4.8 pounds for 1 square foot.

Thickness of strip in thousandths, 18
divided by 300=.06 pound per foot for a 1-inch strip;
divided by 25=.72 pound for 1 square foot.

Bar Steel

Weight per Lineal Foot

One cubic foot weighing 489.54 pounds

SQUARE		ROUND		OCTAGON		HEXAGON	
Inch	Pounds	Inch	Pounds	Inch	Pounds	Inch	Pounds
1/32	.003	1/32	.0026	1/32	.0027	1/32	.0029
1/16	.013	1/16	.0104	1/16	.011	1/16	.0115
1/8	.05	1/8	.042	1/8	.044	1/8	.046
3/16	.12	3/16	.09	3/16	.094	3/16	.10
1/4	.21	1/4	.17	1/4	.18	1/4	.19
5/16	.33	5/16	.26	5/16	.27	5/16	.29
3/8	.48	3/8	.38	3/8	.40	3/8	.42
7/16	.65	7/16	.51	7/16	.54	7/16	.56
1/2	.85	1/2	.67	1/2	.71	1/2	.74
9/16	1.08	9/16	.85	9/16	.90	9/16	.94
5/8	1.33	5/8	1.04	5/8	1.10	5/8	1.15
11/16	1.61	11/16	1.27	11/16	1.34	11/16	1.40
3/4	1.92	3/4	1.50	3/4	1.58	3/4	1.65
13/16	2.24	13/16	1.76	13/16	1.86	13/16	1.94
7/8	2.60	7/8	2.04	7/8	2.15	7/8	2.25
15/16	3.06	15/16	2.35	15/16	2.48	15/16	2.59
1	3.40	1	2.67	1	2.82	1	2.94
1/16	3.84	1/16	3.01	1/16	3.17	1/16	3.31
1/8	4.30	1/8	3.38	1/8	3.56	1/8	3.73
3/16	4.80	3/16	3.77	3/16	3.98	3/16	4.16
1/4	5.31	1/4	4.17	1/4	4.40	1/4	4.60
5/16	5.86	5/16	4.60	5/16	4.85	5/16	5.07
3/8	6.43	3/8	5.02	3/8	5.29	3/8	5.54
7/16	7.03	7/16	5.52	7/16	5.82	7/16	9.09

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

BAR STEEL

WEIGHT PER LINEAL FOOT—Continued

SQUARE		ROUND		OCTAGON		HEXAGON	
Inch	Pounds	Inch	Pounds	Inch	Pounds	Inch	Pounds
1½	7.65	1½	6.01	1½	6.34	1½	5.63
9/16	8.30	9/16	6.52	9/16	6.88	9/16	7.19
5/8	8.98	5/8	7.05	5/8	7.44	5/8	7.77
11/16	9.68	11/16	7.60	11/16	8.02	11/16	8.38
3/4	10.41	3/4	8.18	3/4	8.63	3/4	9.02
13/16	11.17	13/16	8.77	13/16	9.25	13/16	9.67
7/8	11.95	7/8	9.39	7/8	9.90	7/8	10.35
15/16	12.76	15/16	10.02	15/16	10.57	15/16	11.05
2	13.60	2	10.68	2	11.26	2	11.78
1/16	14.46	1/16	11.36	1/16	11.98	1/16	12.53
1/8	15.35	1/8	12.06	1/8	12.72	1/8	13.30
3/16	16.27	3/16	12.78	3/16	13.48	3/16	14.09
1/4	17.22	1/4	13.52	1/4	14.26	1/4	14.91
5/16	18.19	5/16	14.28	5/16	15.06	5/16	15.75
3/8	19.18	3/8	15.07	3/8	15.89	3/8	16.62
7/16	20.20	7/16	15.86	7/16	16.73	7/16	17.49
1/2	21.25	1/2	16.69	1/2	17.60	1/2	18.40
9/16	22.33	9/16	17.53	9/16	18.49	9/16	19.33
5/8	23.43	5/8	18.40	5/8	19.41	5/8	20.29
11/16	24.56	11/16	19.29	11/16	20.35	11/16	21.27
3/4	25.00	3/4	20.20	3/4	21.30	3/4	22.27
13/16	26.90	13/16	21.12	13/16	22.28	13/16	23.29
7/8	28.10	7/8	22.07	7/8	23.28	7/8	24.33
15/16	29.43	15/16	23.04	15/16	24.30	15/16	25.40

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

BAR STEEL

WEIGHT PER LINEAL FOOT—Continued

SQUARE		ROUND		OCTAGON	
Inch	Pounds	Inch	Pounds	Inch	Pounds
3	30.60	3	24.03	3	25.34
1/16	31.89	1/16	25.04	1/16	26.41
1/8	33.20	1/8	26.08	1/8	27.51
3/16	34.55	3/16	27.13	3/16	28.61
1/4	35.92	1/4	28.20	1/4	29.74
5/16	37.31	5/16	29.30	5/16	30.90
3/8	38.73	3/8	30.42	3/8	32.08
7/16	40.18	7/16	31.56	7/16	33.29
1/2	41.65	1/2	32.71	1/2	34.50
9/16	43.14	9/16	33.90	9/16	35.75
5/8	44.68	5/8	35.09	5/8	37.01
11/16	46.24	11/16	36.31	11/16	38.30
3/4	47.82	3/4	37.56	3/4	39.61
13/16	49.42	13/16	38.81	13/16	40.93
7/8	51.05	7/8	40.10	7/8	42.29
15/16	52.71	15/16	41.40	15/16	43.66
4	54.40	4	42.73	4	45.07
1/16	56.11	1/16	44.07	1/16	46.48
1/8	57.85	1/8	45.44	1/8	47.93
3/16	59.62	3/16	46.83	3/16	49.39
1/4	61.41	1/4	48.24	1/4	50.88
5/16	63.23	5/16	49.66	5/16	52.38
3/8	65.08	3/8	51.11	3/8	53.91
7/16	66.95	7/16	52.58	7/16	55.46

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

BAR STEEL

WEIGHT PER LINEAL FOOT—Continued

SQUARE		ROUND		OCTAGON	
Inch	Pounds	Inch	Pounds	Inch	Pounds
4½	68.85	**4½**	54.07	**4½**	57.03
9/16	70.78	9/16	55.59	9/16	58.63
5/8	72.73	5/8	57.12	5/8	60.24
11/16	74.70	11/16	58.67	11/16	61.88
3/4	76.71	3/4	60.25	3/4	63.55
13/16	78.74	13/16	61.84	13/16	65.22
7/8	80.81	7/8	63.46	7/8	66.93
15/16	82.89	15/16	65.10	15/16	68.66
5	85.00	**5**	66.76	**5**	70.41
1/8	89.30	1/8	70.14	1/8	73.98
1/4	93.72	1/4	73.60	1/4	77.63
3/8	98.23	3/8	77.15	3/8	81.37
1/2	102.8	1/2	80.77	1/2	85.19
5/8	107.6	5/8	84.49	5/8	89.11
3/4	112.4	3/4	88.29	3/4	93.12
7/8	117.4	7/8	92.17	7/8	97.21
6	122.4	**6**	96.14	**6**	101.4
1/8	127.6	1/8	100.2	1/8	105.7
1/4	132.8	1/4	104.3	1/4	110.0
3/8	138.2	3/8	108.5	3/8	114.4
1/2	143.0	1/2	112.8	1/2	119.0
5/8	149.2	5/8	117.2	5/8	123.6
3/4	154.9	3/4	121.7	3/4	128.4
7/8	160.8	7/8	126.2	7/8	133.1

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

BAR STEEL

WEIGHT PER LINEAL FOOT—Continued

SQUARE		ROUND		OCTAGON	
Inch	Pounds	Inch	Pounds	Inch	Pounds
7	166.6	**7**	130.8	**7**	138.1
⅛	172.6	⅛	135.6	⅛	143.0
¼	178.7	¼	140.4	¼	148.1
⅜	184.9	⅜	145.3	⅜	153.2
½	191.3	½	150.2	½	158.4
⅝	197.7	⅝	155.2	⅝	163.7
¾	204.2	¾	160.3	¾	169.1
⅞	210.8	⅞	165.6	⅞	174.7
8	217.6	**8**	171.0	**8**	180.4
¼	231.4	¼	181.8	¼	191.7
½	245.6	½	193.0	½	203.6
¾	260.3	¾	204.4	¾	215.6
9	275.4	**9**	216.3	**9**	228.1
¼	290.9	¼	228.5	¼	241.0
½	306.8	½	241.0	½	254.2
¾	323.2	¾	253.9	¾	267.8
10	340.0	**10**	267.0	**10**	281.6
¼	357.2	¼	280.6	¼	295.9
½	374.9	½	294.4	½	310.5
¾	392.9	¾	308.6	¾	325.5
11	411.4	**11**	323.1	**11**	340.8
¼	430.3	¼	337.9	¼	356.4
½	449.6	½	353.1	½	372.4
¾	469.4	¾	368.6	¾	388.8
12	489.6	**12**	384.4	**12**	405.4

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

NOTE

Octagon and Hexagon Bars

The weight per foot of Octagon Steel is found by multiplying the weight per foot of a Round Bar of the same size by 1.0547.

The weight per foot of Hexagon Steel is found by multiplying the weight per foot of a Round Bar of the same size by 1.1026.

Half-Round, Oval and Half-Oval Bar Steel

One cubic foot weighing 489.54 pounds

Half-Round, Inch	Oval, Inch	Pounds per Foot	Half-Oval, Inch	Pounds per Foot
3/8	3/8 x 3/16	.186	3/8 x 3/32	.093
7/16	7/16 x 7/32	.253	7/16 x 7/64	.127
1/2	1/2 x 1/4	.331	1/2 x 1/8	.165
5/8	5/8 x 5/16	.517	5/8 x 5/32	.259
3/4	3/4 x 3/8	.744	3/4 x 3/16	.372
7/8	7/8 x 7/16	1.013	7/8 x 7/32	.507
1	1 x 1/2	1.323	1 x 1/4	.662
1 1/8	1 1/8 x 9/16	1.624	1 1/8 x 9/32	.812
1 1/4	1 1/4 x 5/8	2.067	1 1/4 x 5/16	1.034
1 1/2	1 1/2 x 3/4	2.976	1 1/2 x 3/8	1.488
1 3/4	1 3/4 x 7/8	4.059	1 3/4 x 7/16	2.026
2	2 x 1	5.299	2 x 1/2	2.645

Flat Bar Steel

Pounds per Lineal Foot

One cubic foot weighing 489.54 pounds

Thickness, Inches	Width, Inches						
	½	⅝	¾	⅞	1	1⅛	1¼
1/16 ...	.1060	.1381	.1594	.1859	.212	.2391	.2656
⅛ ...	.2125	.2656	.3188	.3720	.4250	.4782	.5312
3/16 ...	.319	.399	.478	.558	.638	.717	.797
¼ ...	.425	.531	.636	.743	.850	.957	1.06
5/16 ...	.531	.664	.797	.929	1.06	1.20	1.33
⅜ ...	.638	.797	.957	1.116	1.28	1.43	1.59
7/16 ...	.744	.929	1.116	1.302	1.49	1.68	1.86
½ ...	.850	1.06	1.275	1.487	1.70	1.92	2.12
9/16 ...	.957	1.20	1.434	1.674	1.92	2.15	2.39
⅝ ...	1.06	1.33	1.594	1.859	2.12	2.39	2.65
11/16 ...	1.17	1.46	1.753	2.045	2.34	2.63	2.92
¾ ...	1.28	1.60	1.913	2.232	2.55	2.87	3.19
13/16 ...	1.38	1.73	2.072	2.417	2.76	3.11	3.45
⅞ ...	1.49	1.86	2.232	2.604	2.98	3.35	3.72
15/16 ...	1.60	1.99	2.391	2.789	3.19	3.59	3.99
1 ...	1.70	2.13	2.55	2.98	3.40	3.83	4.25
1 1/16 ...	1.81	2.26	2.710	3.161	3.61	4.064	4.52
1⅛ ...	1.91	2.39	2.868	3.347	3.83	4.304	4.78
1 3/16 ...	2.02	2.52	3.03	3.533	4.04	4.54	5.05
1¼ ...	2.12	2.66	3.19	3.72	4.25	4.79	5.31
1 5/16 ...	2.23	2.79	3.35	3.91	4.46	5.02	5.58
1⅜ ...	2.34	2.92	3.51	4.09	4.67	5.26	5.84
1 7/16 ...	2.45	3.06	3.67	4.28	4.89	5.50	6.11
1½ ...	2.55	3.19	3.83	4.47	5.10	5.74	6.38
1 9/16 ...	2.66	3.32	3.99	4.65	5.32	5.98	6.64
1⅝ ...	2.76	3.45	4.15	4.84	5.52	6.22	6.90
1 11/16 ...	2.87	3.59	4.31	5.02	5.74	6.46	7.17
1¾ ...	2.98	3.72	4.47	5.21	5.95	6.70	7.44
1 13/16 ...	3.08	3.85	4.62	5.46	6.16	6.93	7.70
1⅞ ...	3.19	3.99	4.79	5.58	6.38	7.17	7.97
1 15/16 ...	3.30	4.12	4.94	5.77	6.59	7.42	8.24
2 ...	3.40	4.25	5.10	5.95	6.80	7.65	8.50

For HIGH SPEED STEEL, add 10 per cent. to listed weights

FLAT BAR STEEL

POUNDS PER LINEAL FOOT
Continued

Thickness, Inches	Width, Inches						
	1⅜	1½	1⅝	1¾	2	2¼	2½
1/16 ...	.292	.319	.346	.372	.425	.478	.531
⅛ ...	.585	.638	.692	.744	.850	.96	1.06
3/16 ...	.875	.957	1.04	1.15	1.28	1.44	1.59
¼ ...	1.17	1.28	1.38	1.49	1.70	1.92	2.12
5/16 ...	1.46	1.59	1.73	1.86	2.12	2.39	2.65
⅜ ...	1.76	1.92	2.08	2.23	2.55	2.87	3.19
7/16 ...	2.05	2.23	2.42	2.60	2.98	3.35	3.72
½ ...	2.34	2.55	2.72	2.98	3.40	3.83	4.25
9/16 ...	2.63	2.87	3.11	3.35	3.83	4.30	4.78
⅝ ...	2.92	3.19	3.46	3.72	4.25	4.78	5.31
11/16 ...	3.22	3.51	3.80	4.09	4.67	5.26	5.84
¾ ...	3.51	3.83	4.15	4.47	5.10	5.75	6.38
13/16 ...	3.80	4.14	4.49	4.84	5.53	6.21	6.90
⅞ ...	4.09	4.47	4.84	5.20	5.95	6.69	7.44
15/16 ...	4.39	4.78	5.18	5.58	6.38	7.18	7.97
1 ...	4.68	5.10	5.53	5.95	6.80	7.65	8.50
1 1/16 ...	4.97	5.42	5.87	6.32	7.22	8.13	9.03
1⅛ ...	5.26	5.74	6.22	6.70	7.65	8.61	9.57
1 3/16 ...	5.56	6.06	6.56	7.07	8.08	9.09	10.10
1¼ ...	5.85	6.38	6.91	7.44	8.50	9.57	10.63
1 5/16 ...	6.14	6.69	7.25	7.81	8.93	10.04	11.16
1⅜ ...	6.43	7.02	7.60	8.18	9.35	10.52	11.69
1 7/16 ...	6.72	7.34	7.94	8.56	9.78	11.00	12.22
1½ ...	7.02	7.65	8.29	8.93	10.20	11.48	12.75
1 9/16 ...	7.31	7.97	8.74	9.30	10.63	11.95	13.28
1⅝ ...	7.60	8.29	8.98	9.67	11.05	12.43	13.81
1 11/16 ...	7.89	8.61	9.33	10.04	11.47	12.91	14.34
1¾ ...	8.19	8.93	9.67	10.42	11.90	13.40	14.88
1 13/16 ...	8.48	9.24	10.02	10.79	12.33	13.86	15.40
1⅞ ...	8.77	9.57	10.36	11.15	12.75	14.34	15.94
1 15/16 ...	9.06	9.88	10.71	11.53	13.18	14.83	16.47
2 ...	9.35	10.20	11.05	11.90	13.60	15.30	17.00

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

FLAT BAR STEEL

POUNDS PER LINEAL FOOT
Continued

Thickness, Inches	Width, Inches						
	2¾	3	3¼	3½	3¾	4	4¼
1/16 ...	.584	.638	.691	.744	.80	.85	.90
1/8 ...	1.17	1.28	1.38	1.49	1.59	1.70	1.81
3/16 ...	1.75	1.91	2.07	2.23	2.39	2.55	2.71
1/4 ...	2.34	2.55	2.76	2.98	3.19	3.40	3.61
5/16 ...	2.92	3.19	3.45	3.72	3.99	4.25	4.52
3/8 ...	3.51	3.83	4.15	4.47	4.78	5.10	5.42
7/16 ...	4.09	4.46	4.83	5.20	5.58	5.95	6.32
1/2 ...	4.67	5.10	5.53	5.95	6.38	6.80	7.22
9/16 ...	5.26	5.74	6.22	6.70	7.17	7.65	8.13
5/8 ...	5.84	6.38	6.91	7.44	7.97	8.50	9.03
11/16...	6.43	7.02	7.60	8.18	8.76	9.35	9.93
3/4 ...	7.02	7.65	8.29	8.93	9.57	10.20	10.84
13/16...	7.60	8.29	8.98	9.67	10.36	11.05	11.74
7/8 ...	8.18	8.93	9.67	10.41	11.16	11.90	12.65
15/16...	8.77	9.57	10.36	11.16	11.95	12.75	13.55
1 ...	9.35	10.20	11.05	11.90	12.75	13.60	14.45
1 1/16 ...	9.93	10.84	11.74	12.65	13.55	14.45	15.35
1 1/8 ...	10.52	11.48	12.43	13.39	14.34	15.30	16.26
1 3/16 ...	11.11	12.12	13.12	14.13	15.14	16.15	17.16
1 1/4 ...	11.69	12.75	13.81	14.87	15.94	17.00	18.06
1 5/16 ...	12.27	13.39	14.50	15.62	16.74	17.85	18.96
1 3/8 ...	12.85	14.03	15.20	16.36	17.53	18.70	19.87
1 7/16 ...	13.44	14.66	15.88	17.10	18.33	19.55	20.77
1 1/2 ...	14.03	15.30	16.58	17.85	19.13	20.40	21.68
1 9/16 ...	14.61	15.94	17.27	18.60	19.92	21.25	22.58
1 5/8 ...	15.19	16.58	17.96	19.34	20.72	22.10	23.48
1 11/16...	15.78	17.22	18.65	20.08	21.51	22.95	24.38
1 3/4 ...	16.37	17.85	19.34	20.83	22.32	23.80	25.29
1 13/16...	16.95	18.49	20.03	21.57	23.11	24.65	26.19
1 7/8 ...	17.53	19.13	20.72	22.31	23.91	25.50	27.10
1 15/16...	18.12	19.77	21.41	23.06	24.70	26.35	28.00
2 ...	18.70	20.40	22.10	23.80	25.50	27.20	28.90

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

FLAT BAR STEEL

POUNDS PER LINEAL FOOT
Continued

Thickness, Inches	Width, Inches						
	4½	4¾	5	5¼	5½	5¾	6
1/16 ...	.96	1.01	1.06	1.116	1.169	1.222	1.275
1/8 ...	1.91	2.02	2.13	2.232	2.338	2.444	2.550
3/16 ...	2.87	3.03	3.19	3.35	3.51	3.67	3.83
1/4 ...	3.83	4.04	4.25	4.46	4.67	4.89	5.10
5/16 ...	4.78	5.05	5.31	5.58	5.84	6.11	6.38
3/8 ...	5.74	6.06	6.38	6.69	7.02	7.34	7.65
7/16 ...	6.70	7.07	7.44	7.81	8.18	8.56	8.93
1/2 ...	7.65	8.08	8.50	8.93	9.35	9.77	10.20
9/16 ...	8.61	9.09	9.57	10.04	10.52	11.00	11.48
5/8 ...	9.57	10.10	10.63	11.16	11.69	12.22	12.75
11/16...	10.52	11.11	11.69	12.27	12.85	13.44	14.03
3/4 ...	11.48	12.12	12.75	13.39	14.03	14.67	15.30
13/16...	12.43	13.12	13.81	14.50	15.19	15.88	16.58
7/8 ...	13.39	14.13	14.87	15.62	16.36	17.10	17.85
15/16...	14.34	15.14	15.94	16.74	17.53	18.33	19.13
1 ...	15.30	16.15	17.00	17.85	18.70	19.55	20.40
1 1/16 ...	16.26	17.16	18.00	18.96	19.87	20.77	21.68
1 1/8 ...	17.22	18.17	19.13	20.08	21.04	21.99	22.95
1 3/16 ...	18.17	19.18	20.19	21.20	22.21	23.22	24.23
1 1/4 ...	19.13	20.19	21.25	22.32	23.38	24.44	25.50
1 5/16 ...	20.08	21.20	22.32	23.43	24.54	25.66	26.78
1 3/8 ...	21.04	22.21	23.38	24.54	25.71	26.88	28.05
1 7/16 ...	21.99	23.22	24.44	25.66	26.88	28.10	29.33
1 1/2 ...	22.95	24.23	25.50	26.78	28.05	29.33	30.60
1 9/16 ...	23.91	25.24	26.57	27.89	29.22	30.55	31.88
1 5/8 ...	24.87	26.25	27.63	29.01	30.39	31.77	33.15
1 11/16...	25.82	27.26	28.69	30.12	31.55	32.99	34.43
1 3/4 ...	26.78	28.27	29.75	31.24	32.73	34.22	35.70
1 13/16...	27.73	29.27	30.81	32.35	33.89	35.43	36.98
1 7/8 ...	28.69	30.28	31.87	33.47	35.06	36.65	38.25
1 15/16...	29.64	31.29	32.94	34.50	36.23	37.88	39.53
2 ...	30.60	32.30	34.00	35.70	37.40	39.10	40.80

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

FLAT BAR STEEL

POUNDS PER LINEAL FOOT

Continued

Thickness, Inches	Width, Inches						
	6¼	6½	6¾	7	7¼	7½	7¾
1/16 ...	1.328	1.381	1.434	1.487	1.540	1.594	1.647
1/8 ...	2.656	2.762	2.869	2.975	3.081	3.188	3.294
3/16 ...	3.99	4.14	4.30	4.46	4.62	4.78	4.94
1/4 ...	5.31	5.53	5.74	5.95	6.16	6.36	6.58
5/16 ...	6.64	6.90	7.17	7.44	7.70	7.97	8.23
3/8 ...	7.97	8.29	8.61	8.93	9.25	9.57	9.88
7/16 ...	9.29	9.67	10.04	10.41	10.78	11.16	11.53
1/2 ...	10.63	11.05	11.48	11.90	12.32	12.75	13.18
9/16 ...	11.95	12.43	12.91	13.39	13.86	14.34	14.82
5/8 ...	13.28	13.81	14.34	14.87	15.40	15.94	16.47
11/16 ...	14.61	15.20	15.78	16.36	16.94	17.53	18.12
3/4 ...	15.94	16.58	17.22	17.85	18.49	19.13	19.77
13/16 ...	17.27	17.95	18.65	19.34	20.03	20.72	21.41
7/8 ...	18.60	19.34	20.08	20.83	21.57	22.32	23.05
15/16 ...	19.92	20.72	21.51	22.32	23.11	23.91	24.70
1 ...	21.25	22.10	22.95	23.80	24.65	25.50	26.35
1 1/16 ...	22.58	23.48	24.39	25.29	26.19	27.10	28.00
1 1/8 ...	23.91	24.87	25.82	26.78	27.73	28.68	29.64
1 3/16 ...	25.23	26.24	27.25	28.26	29.27	30.28	31.29
1 1/4 ...	26.56	27.62	28.69	29.75	30.81	31.88	32.94
1 5/16 ...	27.90	29.01	30.12	31.22	32.35	33.48	34.59
1 3/8 ...	29.22	30.39	31.56	32.72	33.89	35.06	36.23
1 7/16 ...	30.55	31.77	32.90	34.21	35.44	36.66	37.88
1 1/2 ...	31.88	33.15	34.43	35.70	36.98	38.26	39.53
1 9/16 ...	33.20	34.53	35.86	37.19	38.51	39.84	41.17
1 5/8 ...	34.53	35.91	37.90	38.67	40.05	41.44	42.82
1 11/16 ...	35.86	37.30	38.73	40.16	41.59	43.03	44.47
1 3/4 ...	37.19	38.68	40.17	41.65	43.14	44.63	46.12
1 13/16 ...	38.52	40.05	41.60	43.14	44.68	46.22	47.76
1 7/8 ...	38.85	41.44	43.03	44.63	46.22	47.82	49.40
1 15/16 ...	41.17	42.82	44.46	46.12	47.76	49.41	51.05
2 ...	42.50	44.20	45.90	47.60	49.30	51.00	52.70

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

FLAT BAR STEEL
POUNDS PER LINEAL FOOT
Continued

Thickness, Inches	Width, Inches						
	8	8½	9	9½	10	11	12
1/16 ...	1.70	1.806	1.913	2.019	2.135	2.338	2.55
1/8 ...	3.40	3.612	3.826	4.037	4.250	4.676	5.10
3/16 ...	5.10	5.42	5.74	6.06	6.38	7.02	7.65
1/4 ...	6.80	7.22	7.65	8.08	8.50	9.34	10.20
5/16 ...	8.50	9.03	9.56	10.10	10.62	11.68	12.75
3/8 ...	10.20	10.84	11.48	12.12	12.75	14.03	15.30
7/16 ...	11.90	12.64	13.40	14.14	14.88	16.36	17.85
1/2 ...	13.60	14.44	15.30	16.16	17.00	18.70	20.40
9/16 ...	15.30	16.26	17.22	18.18	19.14	21.02	22.95
5/8 ...	17.00	18.06	19.13	20.19	21.35	23.38	25.50
11/16...	18.70	19.86	21.04	22.21	23.38	25.70	28.05
3/4 ...	20.40	21.68	22.96	24.23	25.50	28.05	30.60
13/16...	22.10	23.48	24.86	26.24	27.62	30.40	33.15
7/8 ...	23.80	25.30	26.78	28.26	29.75	32.72	35.70
15/16...	25.50	27.10	28.69	30.28	31.88	35.06	38.25
1 ...	27.20	28.90	30.60	32.20	34.00	37.40	40.80
1 1/16 ...	28.90	30.70	32.52	34.32	36.12	39.74	43.35
1 1/8 ...	30.60	32.52	34.43	36.34	38.25	42.08	45.90
1 3/16 ...	32.30	34.32	36.34	38.36	40.38	44.42	48.46
1 1/4 ...	34.00	36.12	38.26	40.37	42.50	46.76	51.00
1 5/16 ...	35.70	37.93	40.16	42.40	44.64	49.08	53.54
1 3/8 ...	37.40	39.74	42.08	44.41	46.75	51.42	56.09
1 7/16 ...	39.10	41.54	44.00	46.44	48.88	53.76	58.65
1 1/2 ...	40.80	43.35	45.90	48.45	51.00	56.10	61.20
1 9/16 ...	42.50	45.16	47.82	50.48	53.14	58.42	63.74
1 5/8 ...	44.20	46.96	49.73	52.49	55.25	60.78	66.30
1 11/16...	45.90	48.76	51.64	54.51	57.38	63.10	68.84
1 3/4 ...	47.60	50.58	53.56	56.53	59.50	65.45	71.40
1 13/16...	49.30	52.38	55.46	58.54	61.62	67.80	73.96
1 7/8 ...	51.00	54.20	57.38	60.56	63.75	70.12	76.50
1 15/16...	52.70	56.00	59.29	62.58	65.88	72.46	79.05
2 ...	54.40	57.80	61.20	64.60	68.00	74.80	81.60

For HIGH SPEED STEEL, add 10 per cent. to listed weights.

WEIGHT OF DISCS

To find the weight of discs made of carbon-steel, in diameters up to and including 12 inches, without any allowance for finishing, multiply the per-foot weight of round bar-steel, given on pages 211-215, by the decimal equivalent of a foot found in the following table:

DECIMALS OF A FOOT FOR EACH ⅛ INCH

Inches	0	⅛	¼	⅜	½	⅝	¾	⅞
0	.000	.010	.021	.031	.042	.052	.063	.073
1	.083	.094	.104	.115	.125	.135	.146	.156
2	.167	.177	.188	.198	.208	.219	.229	.240
3	.250	.260	.271	.281	.292	.302	.313	.323
4	.333	.344	.354	.365	.375	.385	.396	.406
5	.417	.427	.438	.448	.458	.469	.479	.490
6	.500	.510	.521	.531	.542	.552	.563	.573
7	.583	.594	.604	.615	.625	.635	.646	.656
8	.667	.677	.688	.698	.708	.719	.729	.740
9	.750	.760	.771	.781	.792	.802	.813	.823
10	.833	.844	.854	.865	.875	.885	.896	.906
11	.917	.927	.938	.948	.958	.969	.979	.990

EXAMPLE. If the weight of a carbon-steel disc 7″ diameter, 1⅝″ thick, is wanted, turn to page 215, where the per-foot weight of 7″ round is given as 130.8 lbs. Multiply this by the decimal equivalent of 1⅝″ or .135, as found in the above table, and the product will be the net weight of the disc.

130.8 pounds=the weight of one foot of 7-inch round steel
.135 =the per-foot decimal equivalent for 1⅝ inches

6540
3924
1308

17.6580 pounds=weight of disc 7 inches diameter 1⅝ inches thick without any allowance for finishing. (See page 84 regarding such allowance.)

For STAR-ZENITH high-speed discs, add 10 per cent. to the weight found for carbon-steel discs.

Cold Rolled Strip-Steel and Flat Wire

Pounds per Lineal Foot

Thickness		Width				
Decimals	BWG	1/4"	5/16"	3/8"	7/16"	1/2"
.300	1	.2550	.3187	.3825	.4463	.5100
.284	2	.2414	.3017	.3621	.4225	.4828
.259	3	.2201	.2751	.3302	.3852	.4403
.238	4	.2023	.2529	.3035	.3540	.4046
.220	5	.1870	.2337	.2805	.3273	.3740
.203	6	.1725	.2157	.2588	.3020	.3451
.180	7	.1530	.1912	.2295	.2678	.3060
.165	8	.1402	.1753	.2104	.2424	.2805
.148	9	.1258	.1572	.1887	.2202	.2516
.134	10	.1139	.1424	.1709	.1993	.2278
.120	11	.1020	.1275	.1530	.1785	.2040
.109	12	.0926	.1158	.1390	.1621	.1853
.095	13	.0807	.1009	.1211	.1413	.1615
.083	14	.0705	.0882	.1058	.1235	.1411
.072	15	.0612	.0765	.0918	.1071	.1224
.065	16	.0552	.0690	.0829	.0967	.1105
.058	17	.0493	.0616	.0740	.0863	.0986
.049	18	.0416	.0520	.0625	.0729	.0833
.042	19	.0357	.0446	.0536	.0625	.0714
.035	20	.0297	.0372	.0446	.0521	.0595
.032	21	.0272	.0340	.0408	.0476	.0544
.028	22	.0238	.0297	.0357	.0417	.0476
.025	23	.0212	.0265	.0319	.0372	.0425
.022	24	.0187	.0234	.0281	.0327	.0374
.03125	1/32"	.0251	.0331	.0398	.0464	.0503
.046875	3/64"	.0398	.0497	.0597	.0696	.0796
.0625	1/16"	.0531	.0664	.0797	.0930	.1063
.078125	5/64"	.0664	.0830	.0996	.1162	.1328
.09375	3/32"	.0796	.0995	.1195	.1394	.1593
.109375	7/64"	.0929	.1161	.1394	.1626	.1858
.125	1/8"	.1062	.1328	.1594	.1860	.2125
.140625	9/64"	.1195	.1494	.1793	.2092	.2390
.15625	5/32"	.1328	.1659	.1992	.2324	.2656
.171875	11/64"	.1460	.1825	.2191	.2555	.2921
.1875	3/16"	.1594	.1992	.2391	.2789	.3188

COLD ROLLED STRIP-STEEL AND FLAT WIRE

POUNDS PER LINEAL FOOT—Continued

Thickness		Width				
Decimals	BWG	9/16″	5/8″	11/16″	3/4″	13/16″
.300	1	.5738	.6375	.7013	.7650	.8288
.284	2	.5432	.6035	.6639	.7242	.7846
.259	3	.4953	.5503	.6054	.6604	.7155
.238	4	.4552	.5058	.5563	.6069	.6575
.220	5	.4208	.4675	.5143	.5610	.6078
.203	6	.3882	.4314	.4745	.5177	.5608
.180	7	.3443	.3825	.4208	.4590	.4973
.165	8	.3156	.3506	.3857	.4208	.4558
.148	9	.2831	.3145	.3460	.3774	.4089
.134	10	.2563	.2848	.3132	.3417	.3702
.120	11	.2295	.2550	.2805	.3060	.3315
.109	12	.2085	.2316	.2548	.2780	.3011
.095	13	.1817	.2019	.2221	.2423	.2624
.083	14	.1587	.1764	.1940	.2117	.2293
.072	15	.1377	.1530	.1683	.1836	.1989
.065	16	.1243	.1381	.1519	.1658	.1796
.058	17	.1109	.1233	.1356	.1479	.1602
.049	18	.0937	.1041	.1145	.1250	.1354
.042	19	.0803	.0893	.0982	.1071	.1160
.035	20	.0669	.0744	.0818	.0893	.0967
.032	21	.0612	.0680	.0748	.0816	.0884
.028	22	.0536	.0595	.0655	.0714	.0774
.025	23	.0478	.0531	.0584	.0638	.0691
.022	24	.0421	.0468	.0514	.0561	.0608
.03125	1/32″	.0597	.0663	.0729	.0796	.0862
.046875	3/64″	.0895	.0995	.1094	.1193	.1293
.0625	1/16″	.1196	.1328	.1461	.1594	.1727
.078125	5/64″	.1494	.1660	.1826	.1992	.2158
.09375	3/32″	.1792	.1991	.2191	.2384	.2589
.109375	7/64″	.2091	.2323	.2555	.2781	.3020
.125	1/8″	.2391	.2657	.2922	.3188	.3453
.140625	9/64″	.2689	.2988	.3286	.3585	.3884
.15625	5/32″	.2988	.3319	.3651	.3983	.4315
.171875	11/64″	.3286	.3651	.4016	.4381	.4746
.1875	3/16″	.3586	.3984	.4383	.4781	.5180

COLD ROLLED STRIP-STEEL AND FLAT WIRE

POUNDS PER LINEAL FOOT—Continued

Thickness		Width				
Decimals	BWG	7/8"	15/16"	1"	1 1/16"	1 1/8"
.300	1	.8925	.9563	1.0200	1.0838	1.1475
.284	2	.8449	.9053	.9656	1.0260	1.0863
.259	3	.7705	.8255	.8806	.9356	.9907
.238	4	.7081	.7586	.8092	.8598	.9104
.220	5	.6545	.7013	.7480	.7948	.8416
.203	6	.6039	.6471	.6902	.7333	.7765
.180	7	.5355	.5738	.6120	.6503	.6885
.165	8	.4909	.5259	.5610	.5961	.6311
.148	9	.4403	.4718	.5032	.5347	.5661
.134	10	.3987	.4271	.4556	.4841	.5126
.120	11	.3570	.3825	.4080	.4355	.4590
.109	12	.3243	.3474	.3706	.3938	.4169
.095	13	.2826	.3028	.3230	.3432	.3634
.083	14	.2469	.2646	.2822	.2998	.3175
.072	15	.2142	.2295	.2448	.2601	.2754
.065	16	.1934	.2072	.2210	.2348	.2486
.058	17	.1726	.1849	.1972	.2095	.2219
.049	18	.1458	.1562	.1666	.1770	.1874
.042	19	.1250	.1339	.1428	.1517	.1607
.035	20	.1041	.1116	.1190	.1264	.1339
.032	21	.0952	.1020	.1088	.1156	.1224
.028	22	.0833	.0893	.0952	.1012	.1071
.025	23	.0744	.0797	.0850	.0903	.0956
.022	24	.0655	.0701	.0748	.0795	.0842
.03125	1/32"	.0929	.0995	.1061	.1127	.1194
.046875	3/64"	.1392	.1492	.1591	.1691	.1790
.0625	1/16"	.1860	.1992	.2125	.2258	.2391
.078125	5/64"	.2323	.2489	.2655	.2821	.2987
.09375	3/32"	.2788	.2987	.3186	.3385	.3584
.109375	7/64"	.3252	.3484	.3716	.3949	.4181
.125	1/8"	.3719	.3985	.4250	.4516	.4782
.140625	9/64"	.4183	.4482	.4780	.5079	.5378
.15625	5/32"	.4647	.4979	.5311	.5643	.5975
.171875	11/64"	.5111	.5476	.5841	.6206	.6571
.1875	3/16"	.5578	.5977	.6375	.6773	.7172

COLD ROLLED STRIP-STEEL AND FLAT WIRE

POUNDS PER LINEAL FOOT—Continued

Thickness		Width				
Decimals	BWG	1 3/16"	1 1/4"	1 5/16"	1 3/8"	1 7/16"
.300	1	1.2113	1.2750	1.3388	1.4025	1.4663
.284	2	1.1467	1.2070	1.2674	1.3277	1.3881
.259	3	1.0457	1.1008	1.1558	1.2108	1.2659
.238	4	.9609	1.0115	1.0621	1.1127	1.1632
.220	5	.8883	.9350	.9818	1.0285	1.0753
.203	6	.8196	.8628	.9059	.9490	.9922
.180	7	.7268	.7650	.8033	.8415	.8798
.165	8	.6662	.7013	.7363	.7714	.8064
.148	9	.5976	.6290	.6605	.6919	.7234
.134	10	.5410	.5695	.5980	.6265	.6549
.120	11	.4845	.5100	.5355	.5610	.5865
.109	12	.4401	.4633	.4864	.5096	.5327
.095	13	.3836	.4038	.4239	.4441	.4643
.083	14	.3351	.3528	.3704	.3880	.4057
.072	15	.2907	.3060	.3213	.3366	.3519
.065	16	.2624	.2763	.2901	.3039	.3177
.058	17	.2342	.2465	.2588	.2712	.2835
.049	18	.1978	.2083	.2187	.2291	.2395
.042	19	.1596	.1785	.1874	.1964	.2053
.035	20	.1413	.1488	.1562	.1636	.1711
.032	21	.1292	.1360	.1428	.1496	.1564
.028	22	.1131	.1190	.1250	.1309	.1369
.025	23	.1009	.1063	.1116	.1169	.1222
.022	24	.0888	.0935	.0982	.1029	.1075
.03125	1/32"	.1260	.1326	.1393	.1459	.1525
.046875	3/64"	.1890	.1989	.2088	.2188	.2287
.0625	1/16"	.2524	.2656	.2789	.2922	.3055
.078125	5/64"	.3153	.3319	.3485	.3652	.3817
.09375	3/32"	.3783	.3983	.4182	.4381	.4580
.109375	7/64"	.4413	.4645	.4878	.5110	.5342
.125	1/8"	.5047	.5313	.5578	.5844	.6110
.140625	9/64"	.5677	.5975	.6274	.6573	.6872
.15625	5/32"	.6307	.6639	.6971	.7302	.7634
.171875	11/64"	.6936	.7301	.7667	.8032	.8397
1875	3/16"	.7570	.7969	.8367	.8766	.9164

COLD ROLLED STRIP-STEEL AND FLAT WIRE

POUNDS PER LINEAL FOOT—Continued

Thickness		Width				
Decimals	BWG	1½″	1 9/16″	1 5/8″	1 11/16″	1¾″
.300	1	1.5300	1.5938	1.6575	1.7213	1.7850
.284	2	1.4484	1.5088	1.5691	1.6295	1.6898
.259	3	1.3209	1.3759	1.4310	1.4860	1.5411
.238	4	1.2138	1.2644	1.3150	1.3655	1.4161
.220	5	1.1220	1.1688	1.2155	1.2623	1.3090
.203	6	1.0353	1.0784	1.1216	1.1647	1.2079
.180	7	.9180	.9563	.9945	1.0328	1.0710
.165	8	.8415	.8766	.9116	.9467	.9818
.148	9	.7548	.7862	.8177	.8492	.8806
.134	10	.6824	.7119	.7404	.7588	.7973
.120	11	.6120	.6375	.6630	.6885	.7140
.109	12	.5559	.5791	.6022	.6254	.6486
.095	13	.4845	.5047	.5249	.5451	.5653
.083	14	.4233	.4409	.4586	.4762	.4939
.072	15	.3672	.3825	.3978	.4131	.4284
.065	16	.3315	.3453	.3591	.3729	.3868
.058	17	.2958	.3081	.3205	.3328	.3451
.049	18	.2499	.2603	.2707	.2811	.2916
.042	19	.2142	.2231	.2321	.2410	.2499
.035	20	.1785	.1859	.1934	.2008	.2083
.032	21	.1632	.1700	.1768	.1836	.1904
.028	22	.1428	.1488	.1547	.1607	.1666
.025	23	.1275	.1328	.1381	.1434	.1488
.022	24	.1122	.1169	.1216	.1262	.1309
.03125	1/32″	.1591	.1658	.1724	.1790	.1857
.046875	3/64″	.2387	.2486	.2586	.2685	.2785
.0625	1/16″	.3188	.3321	.3453	.3586	.3719
.078125	5/64″	.3983	.4149	.4315	.4481	.4647
.09375	3/32″	.4779	.4978	.5177	.5376	.5575
.109375	7/64″	.5574	.5807	.6039	.6271	.6504
.125	1/8″	.6375	.6641	.6906	.7172	.7438
.140625	9/64″	.7170	.7469	.7768	.8067	.8365
.15625	5/32″	.7966	.8298	.8630	.8962	.9294
.171875	11/64″	.8762	.9127	.9492	.9857	1.0222
.1875	3/16″	.9563	.9961	1.0359	1.0758	1.1156

COLD ROLLED STRIP-STEEL AND FLAT WIRE

POUNDS PER LINEAL FOOT—Continued

Thickness		Width				
Decimals	BWG	1⅞″	2″	2⅛″	2¼″	2⅜″
.300	1	1.9125	2.0400	2.1675	2.2950	2.4225
.284	2	1.8105	1.9312	2.0519	2.1726	2.2933
.259	3	1.6511	1.7612	1.8713	1.9814	2.0914
.238	4	1.5173	1.6184	1.7196	1.8207	1.9219
.220	5	1.4025	1.4960	1.5895	1.6830	1.7765
.203	6	1.2941	1.3804	1.4667	1.5530	1.6392
.180	7	1.1475	1.2240	1.3005	1.3770	1.4535
.165	8	1.0519	1.1220	1.1921	1.2623	1.3324
.148	9	.9435	1.0064	1.0693	1.1322	1.1951
.134	10	.8543	.9112	.9682	1.0251	1.0821
.120	11	.7650	.8160	.8670	.9180	.9690
.109	12	.6949	.7412	.7875	.8339	.8802
.095	13	.6056	.6460	.6864	.7268	.7671
.083	14	.5291	.5644	.5997	.6350	.6702
.072	15	.4590	.4896	.5202	.5508	.5814
.065	16	.4144	.4420	.4696	.4973	.5249
.058	17	.3698	.3944	.4191	.4437	.4684
.049	18	.3124	.3332	.3540	.3749	.3957
.042	19	.2678	.2856	.3035	.3213	.3392
.035	20	.2231	.2380	.2529	.2678	.2826
.032	21	.2040	.2176	.2312	.2448	.2584
.028	22	.1785	.1904	.2023	.2142	.2261
.025	23	.1594	.1700	.1806	.1913	.2019
.022	24	.1403	.1496	.1590	.1683	.1777
.03125	1/32″	.1989	.2122	.2254	.2387	.2520
.046875	3/64″	.2984	.3182	.3381	.3580	.3779
.0625	1/16″	.3985	.4250	.4516	.4782	.5047
.078125	5/64″	.4979	.5311	.5643	.5975	.6307
.09375	3/32″	.5974	.6372	.6770	.7168	.7567
.109375	7/64″	.6968	.7432	.7897	.8362	.8826
.125	1/8″	.7969	.8500	.9032	.9563	1.0094
.140625	9/64″	.8963	.9561	1.0158	1.0755	1.1360
.15625	5/32″	.9958	1.0622	1.1286	1.1949	1.2613
.171875	11/64″	1.0952	1.1682	1.2412	1.3143	1.3873
.1875	3/16″	1.1953	1.2750	1.3547	1.4344	1.5140

COLD ROLLED STRIP-STEEL AND FLAT WIRE

POUNDS PER LINEAL FOOT—Continued

Thickness		Width				
Decimals	BWG	2½″	2⅝″	2¾″	2⅞″	3″
.300	1	2.5500	2.6775	2.8050	2.9325	3.0600
.284	2	2.4140	2.5347	2.6554	2.7761	2.8968
.259	3	2.2015	2.3116	2.4217	2.5317	2.6418
.238	4	2.0230	2.1242	2.2253	2.3265	2.4276
.220	5	1.8700	1.9635	2.0570	2.1505	2.2440
.203	6	1.7255	1.8118	1.8981	1.9843	2.0706
.180	7	1.5300	1.6065	1.6830	1.7595	1.8360
.165	8	1.4025	1.4726	1.5428	1.6129	1.6830
.148	9	1.2580	1.3209	1.3838	1.4467	1.5096
.134	10	1.1390	1.1960	1.2529	1.3099	1.3668
.120	11	1.0200	1.0710	1.1220	1.1730	1.2240
.109	12	.9265	.9728	1.0192	1.0655	1.1118
.095	13	.8075	.8479	.8883	.9286	.9690
.083	14	.7055	.7408	.7761	.8113	.8466
.072	15	.6120	.6426	.6732	.7038	.7344
.065	16	.5525	.5801	.6078	.6354	.6630
.058	17	.4930	.5177	.5432	.5670	.5916
.049	18	.4165	.4373	.4582	.4790	.4998
.042	19	.3570	.3749	.3927	.4106	.4284
.035	20	.2975	.3124	.3273	.3421	.3570
.032	21	.2720	.2856	.2992	.3128	.3264
.028	22	.2380	.2499	.2618	.2737	.2856
.025	23	.2125	.2231	.2338	.2444	.2550
.022	24	.1870	.1964	.2057	.2151	.2244
.03125	1/32″	.2652	.2785	.2917	.3050	.3182
.046875	3/64″	.3978	.4177	.4376	.4575	.4774
.0625	1/16″	.5313	.5578	.5844	.6110	.6375
.078125	5/64″	.6639	.6971	.7303	.7634	.7966
.09375	3/32″	.7965	.8363	.8761	.9159	.9557
.109375	7/64″	.9291	.9755	1.0220	1.0684	1.1149
.125	1/8″	1.0625	1.1157	1.1688	1.2219	1.2750
.140625	9/64″	1.1950	1.2548	1.3145	1.3743	1.4341
.15625	5/32″	1.3277	1.3941	1.4605	1.5269	1.5932
.171875	11/64″	1.4603	1.5333	1.6063	1.6793	1.7524
.1875	3/16″	1.5938	1.6734	1.7531	1.8328	1.9125

WIRE GAUGES

Sizes in Decimal Parts of an Inch

Number of Wire Gauge	American or Brown and Sharpe Gauge	Birmingham or Stubs' Iron Wire	Pounds Per Foot, 1 Inch Wide B.W.G.	Washburn and Moen, Roebling or Steel Wire Gauge	British Imperial or Standard Gauge	Polished Drill-Rod or Stubs' Steel Wire	Morse Twist Drill Gauge
0000000	.....	.....	.....	.49	.500	.....	.....
000000	.....	.....	.....	.46	.464	.....	.....
00000	.....	.....	.....	.43	.432	.....	.....
0000	.460	.454	1.512	.3938	.400	.....	.....
000	.40964	.425	1.415	.3625	.372	.....	.....
00	.3648	.380	1.265	.3310	.348	.....	.....
0	.32486	.340	1.132	.3065	.324	.....	.....
1	.2893	.300	1.000	.2830	.300	.227	.2280
2	.25763	.284	.946	.2625	.276	.219	.2210
3	.22942	.259	.863	.2437	.252	.212	.2130
4	.20431	.238	.793	.2253	.232	.207	.2090
5	.18194	.220	.733	.2070	.212	.204	.2055
6	.16202	.203	.676	.1920	.192	.201	.2040
7	.14428	.180	.600	.1770	.176	.199	.2010
8	.12849	.165	.550	.1620	.160	.197	.1990
9	.11443	.148	.493	.1483	.144	.194	.1960
10	.10189	.134	.446	.1350	.128	.191	.1935
11	.090742	.120	.400	.1205	.116	.188	.1910
12	.080808	.109	.363	.1055	.104	.185	.1890
13	.071961	.095	.316	.0915	.092	.182	.1850

For fractions of one inch in equivalent decimals, see page 234.

WIRE GAUGES

Sizes in Decimal Parts of an Inch—Continued

Number of Wire Gauge	American or Brown and Sharpe Gauge	Birmingham or Stubs' Iron Wire	Pounds Per Foot, 1 Inch Wide B.W.G.	Washburn and Moen, Roebling or Steel Wire Gauge	British Imperial or Standard Gauge	Polished Drill-Rod or Stubs' Steel Wire	Morse Twist Drill Gauge
14	.064084	.083	.276	.0800	.080	.180	.1820
15	.057068	.072	.240	.0720	.072	.178	.1800
16	.05082	.065	.217	.0625	.064	.175	.1770
17	.045257	.058	.193	.0540	.056	.172	.1730
18	.040303	.049	.165	.0475	.048	.168	.1695
19	.03589	.042	.140	.0410	.040	.164	.1660
20	.031961	.035	.117	.0348	.036	.161	.1610
21	.028462	.032	.107	.03175	.032	.157	.1590
22	.025347	.028	.093	.0286	.028	.155	.1570
23	.022571	.025	.083	.0258	.024	.153	.1540
24	.0201	.022	.073	.0230	.022	.151	.1520
25	.0179	.02	.067	.0204	.020	.148	.1495
26	.01594	.018	.060	.0181	.018	.146	.1470
27	.014195	.016	.053	.0173	.0164	.143	.1440
28	.012641	.014	.047	.0162	.0149	.139	.1405
29	.011257	.013	.044	.0150	.0136	.134	.1360
30	.010025	.012	.040	.0140	.0124	.127	.1285
31	.008928	.01	.0333	.0132	.0116	.120	.1200
32	.00795	.009	.0300	.0128	.0108	.115	.1160
33	.00708	.008	.0266	.0118	.0100	.112	.1130

For fractions of one inch in equivalent decimals, see page 234

WIRE GAUGES

Sizes in Decimal Parts of an Inch—Continued

Number of Wire Gauge	American or Brown and Sharpe Gauge	Birmingham or Stubs' Iron Wire	Pounds Per Foot, 1 Inch Wide B.W.G.	Washburn and Moen, Roebling or Steel Wire Gauge	British Imperial or Standard Gauge	Polished Drill-Rod or Stubs' Steel Wire	Morse Twist Drill Gauge
34	.006304	.007	.0233	.0104	.0092	.110	.1110
35	.005614	.005	.0167	.0095	.0084	.108	.1100
36	.005	.004	.0133	.0090	.0076	.106	.1065
37	.004453	.....	.....	.....	.0068	.103	.1040
38	.003965	.....	.....	.....	.0060	.101	.1015
39	.003531	.....	.....	.....	.0052	.099	.0995
40	.003144	.....	.....	.....	.0048	.097	.0980
41	.....	.....	.....	.....	.0044	.095	.0960
42	.....	.....	.....	.....	.0040	.092	.0935
43	.....	.....	.....	.....	.0036	.088	.0890
44	.....	.....	.....	.....	.0032	.085	.0860
45	.....	.....	.....	.....	.0028	.081	.0820
46	.....	.....	.....	.....	.0024	.079	.0810
47	.....	.....	.....	.....	.0020	.077	.0785
48	.....	.....	.....	.....	.0016	.075	.0760
49	.....	.....	.....	.....	.0012	.072	.0730
50	.....	.....	.....	.....	.0010	.069	.0700

For Stubs' Steel Wire or Drill-Rod Gauge, from Z to A, see pages 191-193, and from Nos. 51 to 80, see pages 196-197.

For fractions of one inch in equivalent decimals, see page 234.

FRACTIONS OF ONE INCH IN DECIMAL EQUIVALENTS

8THS	$\frac{9}{32}$ = .28125	$\frac{19}{64}$ = .296875
$\frac{1}{8}$ = .125	$\frac{11}{32}$ = .34375	$\frac{21}{64}$ = .328125
$\frac{1}{4}$ = .25	$\frac{13}{32}$ = .40625	$\frac{23}{64}$ = .359375
$\frac{3}{8}$ = .375	$\frac{15}{32}$ = .46875	$\frac{25}{64}$ = .390625
$\frac{1}{2}$ = .50	$\frac{17}{32}$ = .53125	$\frac{27}{64}$ = .421875
$\frac{5}{8}$ = .625	$\frac{19}{32}$ = .59375	$\frac{29}{64}$ = .453125
$\frac{3}{4}$ = .75	$\frac{21}{32}$ = .65625	$\frac{31}{64}$ = .484375
$\frac{7}{8}$ = .875	$\frac{23}{32}$ = .71875	$\frac{33}{64}$ = .515625
16THS	$\frac{25}{32}$ = .78125	$\frac{35}{64}$ = .546875
$\frac{1}{16}$ = .0625	$\frac{27}{32}$ = .84375	$\frac{37}{64}$ = .578125
$\frac{3}{16}$ = .1875	$\frac{29}{32}$ = .90625	$\frac{39}{64}$ = .609375
$\frac{5}{16}$ = .3125	$\frac{31}{32}$ = .96875	$\frac{41}{64}$ = .640625
$\frac{7}{16}$ = .4375		$\frac{43}{64}$ = .671875
$\frac{9}{16}$ = .5625	64THS	$\frac{45}{64}$ = .703125
$\frac{11}{16}$ = .6875	$\frac{1}{64}$ = .015625	$\frac{47}{64}$ = .734375
$\frac{13}{16}$ = .8125	$\frac{3}{64}$ = .046875	$\frac{49}{64}$ = .765625
$\frac{15}{16}$ = .9375	$\frac{5}{64}$ = .078125	$\frac{51}{64}$ = .796875
32DS	$\frac{7}{64}$ = .109375	$\frac{53}{64}$ = .828125
$\frac{1}{32}$ = .03125	$\frac{9}{64}$ = .140625	$\frac{55}{64}$ = .859375
$\frac{3}{32}$ = .09375	$\frac{11}{64}$ = .171875	$\frac{57}{64}$ = .890625
$\frac{5}{32}$ = .15625	$\frac{13}{64}$ = .203125	$\frac{59}{64}$ = .921875
$\frac{7}{32}$ = .21875	$\frac{15}{64}$ = .234275	$\frac{61}{64}$ = .953125
	$\frac{17}{64}$ = .265625	$\frac{63}{64}$ = .984375

TO CONVERT A COMMON FRACTION INTO A DECIMAL

Divide the numerator by the denominator, adding to the numerator as many ciphers prefixed by a decimal point as are necessary to give the number of decimal places desired in the result:

$\frac{1}{3}=1.0000\div3=0.3333+$

TO CONVERT A DECIMAL INTO A COMMON FRACTION

Set down the decimal as a numerator, and place as the denominator 1 with as many ciphers annexed as there are decimal places in the numerator; erase the decimal point in the numerator and reduce the fraction thus formed to its lowest terms:

$0.125=\frac{125}{1000}=\frac{1}{8}$; $0.3333=\frac{3333}{10000}=\frac{1}{3}$, nearly.

THERMOMETER SCALE

Freezing point = 32° Fahr. = 0° Cent.
Boiling point = 212° Fahr. = 100° Cent

The Fahrenheit thermometer is generally used in the United States, and the Centigrade thermometer in countries using the metric system. In many metallurgical treatises in English, however, Centigrade temperatures are also used.

To convert degrees Centigrade into degrees Fahrenheit, multiply by 9, divide the product by 5 and add 32.

To convert degrees Fahrenheit into degrees Centigrade, first subtract 32; multiply the remainder by 5 and divide the product by 9.

EXAMPLES

To find the equivalent in Fahrenheit degrees of 600 degrees Centigrade:

$$\text{Deg. Fahr.} = \frac{9 \times 600}{5} + 32 = 1112°$$

To find the equivalent in Centigrade degrees of 1112 degrees Fahrenheit:

$$\text{Deg. Cent.} = \frac{(1112 - 32)5}{9} = \frac{1080 \times 5}{9} = 600°$$

TEMPERATURES

Degrees Fahrenheit and Corresponding Centigrade

F.	C.	F.	C.	F.	C.
32	0	1040	560	1740	949
212	100	1060	571	1760	960
400	204	1080	582	1780	971
420	216	1100	593	1800	982
440	227	1120	604	1820	993
460	238	1140	615	1840	1004
480	249	1160	626	1860	1015
500	260	1180	637	1880	1026
520	271	1200	648	1900	1038
540	282	1220	659	1920	1049
560	293	1240	670	1940	1060
580	305	1260	681	1960	1071
600	316	1280	693	1980	1082
620	327	1300	705	2000	1093
640	338	1320	716	2020	1105
660	349	1340	727	2040	1116
680	360	1360	738	2060	1127
700	371	1380	749	2080	1138
720	382	1400	760	2100	1149
740	393	1420	771	2120	1160
760	405	1440	782	2140	1171
780	416	1460	793	2160	1182
800	427	1480	804	2180	1193
820	438	1500	816	2200	1204
840	449	1520	827	2220	1216
860	460	1540	838	2240	1227
880	471	1560	849	2260	1238
900	482	1580	860	2280	1249
920	493	1600	871	2300	1260
940	504	1620	882	2320	1271
960	516	1640	893	2340	1283
980	527	1660	904	2360	1294
1000	538	1680	915	2380	1305
1020	549	1700	927	2400	1316

Degrees Centigrade and Corresponding Fahrenheit

C.	F.	C.	F.	C.	F.
0	32	520	968	860	1580
100	212	530	986	870	1598
200	392	540	1004	880	1616
210	410	550	1022	890	1634
220	428	560	1040	900	1652
230	446	570	1058	910	1670
240	464	580	1076	920	1688
250	482	590	1094	930	1706
260	500	600	1112	940	1724
270	518	610	1130	950	1742
280	536	620	1148	960	1760
290	554	630	1166	970	1778
300	572	640	1184	980	1796
310	590	650	1202	990	1814
320	608	660	1220	1000	1832
330	626	670	1238	1010	1850
340	644	680	1256	1020	1868
350	662	690	1274	1030	1886
360	680	700	1292	1040	1904
370	698	710	1310	1050	1922
380	716	720	1328	1060	1940
390	734	730	1346	1070	1958
400	752	740	1364	1080	1976
410	770	750	1382	1090	1994
420	788	760	1400	1100	2012
430	806	770	1418	1110	2030
440	824	780	1436	1120	2048
450	842	790	1454	1130	2066
460	860	800	1472	1140	2084
470	878	810	1490	1150	2102
480	896	820	1508	1160	2120
490	914	830	1526	1170	2138
500	932	840	1544	1180	2156
510	950	850	1562	1190	2174

METRIC CONVERSION FACTORS

1 gram = 15.432 grains

1 meter = 39.371 inches, or 3.28083 feet

1 millimeter = 0.03937 inch, or 1/25 inch, nearly

1 metric ton / 1000 kilograms = 2204.6 pounds or .9842 ton of 2240 pounds

1.016 metric ton / 1016 kilograms = 1 ton of 2240 pounds

	Inches to Millimeters	Millimeters to Inches	Pounds to Kilograms	Kilograms to Pounds
1 =	25.4001	.039371	0.45359	2.20462
2 =	50.8001	.078742	0.90719	4.40924
3 =	76.2002	.118112	1.36078	6.61386
4 =	101.6002	.157483	1.81437	8.81849
5 =	127.0003	.196854	2.26796	11.02311
6 =	152.4003	.236225	2.72156	13.22773
7 =	177.8004	.275596	3.17515	15.43235
8 =	203.2004	.314966	3.62874	17.63697
9 =	228.6005	.354337	4.08233	19.84159
10 =	254.0006	.393708	4.35592	22.04622
11 =	279.4007	.433079	4.98951	24.25084
12 =	304.8006	.472450	5.44312	26.45546
13 =	330.2007	.511821	5.89671	28.66008
14 =	355.6008	.551192	6.35030	30.86470
15 =	381.0002	.590563	6.80389	33.06932
16 =	406.4008	.629932	7.25748	35.27394
17 =	431.8009	.669303	7.71107	36.47856
18 =	457.2010	.708674	8.16566	39.68318
19 =	482.6011	.748045	8.61925	41.88780

1 kilogram per sq. centimeter = 14.2234 lbs. per sq. in.

1 kilogram per sq. millimeter = 1422.32 lbs. per sq. in.

1000 lbs. per sq. in. = 0.70308 kilogram per sq. mm. / 70.308 kilograms per sq. cm.

FRACTIONS OF ONE MILLIMETER IN EQUIVALENT DECIMALS OF AN INCH

MM. Inches	MM. Inches	MM. Inches
.10 = .00394	.41 = .01614	.72 = .02835
.11 = .00433	.42 = .01654	.73 = .02874
.12 = .00472	.43 = .01693	.74 = .02913
.13 = .00512	.44 = .01732	.75 = .02953
.14 = .00551	.45 = .01772	.76 = .02992
.15 = .00591	.46 = .01811	.77 = .03032
.16 = .00630	.47 = .01850	.78 = .03071
.17 = .00669	.48 = .01890	.79 = .03110
.18 = .00709	.49 = .01929	.80 = .03150
.19 = .00748	.50 = .01969	.81 = .03189
.20 = .00787	.51 = .02008	.82 = .03228
.21 = .00827	.52 = .02047	.83 = .03268
.22 = .00866	.53 = .02087	.84 = .03307
.23 = .00906	.54 = .02126	.85 = .03346
.24 = .00945	.55 = .02165	.86 = .03386
.25 = .00984	.56 = .02205	.87 = .03425
.26 = .01024	.57 = .02244	.88 = .03465
.27 = .01063	.58 = .02283	.89 = .03504
.28 = .01102	.59 = .02323	.90 = .03543
.29 = .01142	.60 = .02362	.91 = .03583
.30 = .01181	.61 = .02402	.92 = .03622
.31 = .01220	.62 = .02441	.93 = .03661
.32 = .01260	.63 = .02480	.94 = .03701
.33 = .01299	.64 = .02520	.95 = .03740
.34 = .01339	.65 = .02559	.96 = .03780
.35 = .01378	.66 = .02598	.97 = .03819
.36 = .01417	.67 = .02638	.98 = .03858
.37 = .01457	.68 = .02677	.99 = .03898
.38 = .01496	.69 = .02717	1 = .03937
.39 = .01535	.70 = .02756	
.40 = .01575	.71 = .02795	

USEFUL RULES

To find the area of a triangle, multiply the base by one-half the perpendicular height.

To find the area of a trapezoid, add the two parallel sides together and multiply the sum by half the perpendicular distance between them.

To find the area of a regular octagon, multiply the square of the diameter of the inscribed circle by .828. For the weight of an octagon bar, see p. 216.

To find the area of a regular hexagon, multiply the square of the diameter of the inscribed circle by .866. For the weight of a hexagon bar, see p. 216.

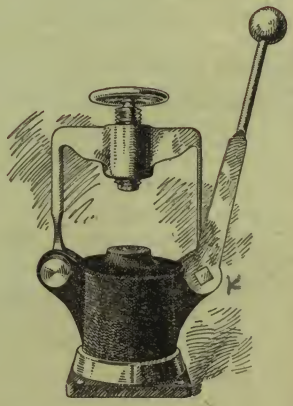
To find the area of a circle, multiply the square of the diameter by .7854.

To find the area of the section of a flat bar, or the area of a rectangle, multiply the width by the thickness.

To find the number of cubic inches in any bar, multiply the area of its section in inches by its length in inches.

Having the number of cubic inches in any bar, to find its weight in carbon-steel, multiply by .2833 if exact weight is desired; or multiply by .3 if a practical weight, such as you are likely to get, is wanted. See page 210. For the weight of high-speed steel add 10 per cent. to the weight found for carbon-steel. For the weight of wrought iron, multiply the cubic inches by .28. For the weight of cast iron, multiply the cubic inches by .26.

Small Guillery Apparatus for determining the Brinell hardness of steel, either annealed or drawn to a definite degree



INDEX

	Page
Air-Hardening Tool-Steel	32
Alloy Spring-Steels—See Spring Steels	
Alloy Tool-Steels—See Tool-Steels	
Annealing	18
Anvil-Face Steel	136
Areas: Rules for Finding	239
Auger-Bit Steel	119
Automobile Steels	143
Awl Wire	183
Axe Steel	119
Axle Steel	144
Backing Steel	144
Band-Saw Steel	171–176
Bar Steel:	
Cold-Drawn	178–180
Price List	179–180
Weight of	210–222
Berkshire-R Die-Blocks	82
Berkshire-S " "	82
Berkshire-T " "	82
Beveled High-Speed Tool-Steel	30–31
Butcher-Saw Steel	171–176
Cant-Hook Steel	144
Carbon in Tool-Steel	12
Carbon Spring-Steel—See Spring Steels	
Carbon-Temper	38
Numbers and Hardening Heats	13, 46, 47
Carbon Tool-Steel—See also Tool-Steels	
Drill Rods	186–198
Hardening of	38–47
Photo-Micrographs of	43
Process of Making	34
Tempering of	48, 49

Page

Carsco Magnet Steel....134, 135
Castings, Chrome-Nickel Steel.... 145
Centigrade and Corresponding Fahrenheit....235, 236
Chain Steels, Cold-Rolled 171–176
Chisel-Bit Steel.... 63
Chrome-Nickel Rifle-Barrel Steel.... 132
Chrome-Nickel Steel Castings.... 145
Chrome-Vanadium Spring-Steel.... 126
Chuck-Jaw Steel.... 144
Claims for Labor or Damages.... 22
Classifications—See also Price Lists
Bar Steel, Cold-Drawn 179, 180
Cutlery Steel.... 118
Die-Block.... 83
Disc.... 84
File Steel 120
Machinery Steel:
Crucible 129
Open-Hearth....130, 131
Pivot Steel.... 125
Spring-Steel.... 127
Tool-Steel.... 64, 65
Coal-Auger Steel.... 119
Cold-Drawn Bar Steel....178, 180
Price List 179, 180
Cold-Rolled and Drawn Steel Specialties....169–198
Cold-Rolled Spring Steel 171–173
Cold-Rolled Strip-Steel and Flat Wire....171–177
How to Order....172, 176
Price List....174–177
Weight of....224–230, 231–233
Color Scale of Temperatures.... 39
Colors, Temper.... 48, 49
Comet Tool-Steel.... 37
Cone Steel.... 136

Page

Contracts and Sales 20
Crucible Machinery Steel 128
Crucible Spring-Steel 126
Cutlery Steel 118
Cubic Contents of Bars, Rule for Finding 239

Decimal Equivalents of Parts of Inch 234
Decimal Equivalents of Parts of Millimeter 238
Deliveries 20
Die-Blocks 82, 83
Classification 83
Grades: Alloy Steel 82
Nickel Steel 82
Open-Hearth Steel 82
Tool-Steel 82
Hardening 83
Tempering 83
Discs 84–117
Classification 84
Price List 86–117
Sizes 86–117
Weight of 223
Die-Steel:
K-W 58
Keystone Hot-Header 59
Reading Double-Special 58
Stentor (Unshrinking) 59
T-K Alloy 57
T-K Special Alloy 56
Wire-Drawing 63
Dipper-Tooth Steel 144
Directions for Working:
Air-Hardening Tool-Steel 32
Beveled High-Speed Tool-Steel 31
Comet Tool-Steel 38, 45–49

Directions for Working—Continued Page
Extra Tool-Steel....38, 45–49
Extra-Special Tool-Steel....38, 45–49
Fast-Finishing Tool-Steel.... 33
Special Service Alloy Tool-Steels.... 53
Special Tool-Steel....38, 45–49
Standard Tool-Steel....38, 45–49
Star-Zenith High-Speed Tool-Steel.... 28, 29
Straight-Carbon Tool-Steel....38, 45–49
Titan Tool-Steel....38, 45–49
Treated Bars.... 30
Zenith High-Speed Tool-Steel.... 28, 29
Double Extra Wire-Die Steel 63
Drawing-Die Steel.... 63
Drawn Steel Specialties....169–198
Dresser Steel.... 137
Drill-Rods, Tool-Steel....186–198
Price List....186, 188–198
Sizes....186, 188–198
Weight of 188–198
Drill Steel.... 137

Electrical Resistance Wire....184, 185
Emery-Wheel Dresser Steel.... 137
English Equivalents of French Units 237–238
Equivalents, Fractions to Decimals 234
Express Shipments.... 20
Extra Tool-Steel.... 36
Extra-Special Tool-Steel.... 35
Eye-Pin Steel.... 144

Facing Steel 136
Fahrenheit and Corresponding Centigrade....235–236
Fast-Finishing Tool-Steel.... 33
Feather, or Shim Steel 144

Page

File Steels....120–124
Classification....120
Shapes and Sizes....121–124
Flat Bar Steel, Weight of....217–222
Flat Steel Wire....171–176, 181
How to Order....172, 173
Price List....174–176
Weight of....224–230, 231–233
Flexo Spring-Steel....126
Fly-Bar Steel....136
Forcep Steel....144
Forging of Tool-Steel....14
Forgings....138–141
Heat-Treatment of....139
Fork (Agricultural) Steel....144
Fractions of Inch, Decimal Equivalents....234
Fractions of Millimeter, Decimal Equivalents, 238
Fractures....24, 34
Frame-Steel....136
Freights, Special Notice....22
French Measures and English Equivalents....237–238
Furnace-Bar Steel....144

Gear-blanks or Discs....84–117
Gun Steel....136
Grades of Tool-Steel....10

Hack-Saw Steel....171–176
Hammer Steel....136
Hardening....16, 38, 53
Die-Blocks....83
Hardening Heats....41–47
Corresponding Carbon-Temper Numbers, 46, 47
Harrow-Tooth Steel....144

Page

Hatchet Steel 119
Heat Colors 39
Heat-Treatments of Forgings 139
Heddle Wire 181
High-Speed Tool-Steels 25, 32
Beveled, for Cutting-Off Tools 31
Classification 64, 65
Discs 84–117
Hardened for Tool-Holders 30
Working of 28, 29
Hot-Header Steel 59

Ice-Plow Steel 144
Ingot-Iron, Norswede 132

J-Y Alloy-Steel 60
Jar-Steel 144
Jason Roll-Steel 60
Jewelers Die-Blocks, Beveled 83
Jordan-Bar Steel 136

K-W Die Steel 58
Key Steel 144
Keystone Hot-Header Steel 59
Knife Steel, Veneer 62

Labels 22
Latch-Needle Wire 183
Lawn-Mower Steel 119
Lock-Nut Steel 144

Machinery Steels 128–131
Crucible 128
Classification 129
Open Hearth 128
Classification 130, 131

Page

Machinery Steel, Paper 136
Magnet Steel 133–135
"Carsco" 134, 135
Permanent 133, 134
Mattock and Pick Steel 144
Metric Conversion Factors 237
Midas Steel 61
Motor-Spring Steel 171–176

Nail-Puller Steel 144
Needle-Wire 183
Nickel-Steel Die-Blocks 82
Norswede Ingot-Iron 132

Open-Hearth Steel Die-Blocks 82
Open-Hearth Machinery Steel 128
Open-Hearth Spring-Steel 126
Ordering:
Cold-Rolled Strip-Steel and Flat Wire 172, 173
Tool-Steel 21

Paper Machinery Steel 136
Payments 20
Permanent Magnet Steel 133, 134
Photo-Micrographs of Hardened Tool-Steels, 43
Pick and Mattock Steel 144
Pivot Steel 124
Classification 125
Plane-Iron Edge Steel 144
Presto Spring-Steel 126
Presto Steel 61
Price Lists—See also Classifications
Cold-Drawn Bar-Steel 179, 180
Cold-Rolled Strip-Steel 174–176
Drill-Rods 186, 188–198
Safety Razor Steel 177

Price Lists—Continued Page
Wire: Electrical Resistance 185
Flat 174
Needle 183
Round 182

Quotations 20

Razor Steel 119
Reading Alloy Chisel-Bit Steel 63
Reading Double-Special Die-Blocks 82
Reading Double-Special Steel 58
Receiver Steel 136
Rifle-Barrel Steel 132
Rings 84
Price List 85
Roll-Steel, Jason 60
Roller Steel 137
Rolls and Trunnion-Balls 141
Roll-Turning Steel 62
Round Steel Wire, Cold-Drawn 181, 182
Rule-Steel, Cold-Rolled 171–176
Price List 181
Rules for:
Finding Areas 239
" Cubic Contents of Bars 239
" Weight of Bars 239

Safety-Razor Steel 177
Safety-Tread Steel 144
Sales and Contracts 20
Samson Steel 143
Sash-Balance Wire 181
Saw Steels 171–177
Screw-Driver Steel 144
Scythe Steel 144

	Page
Set-Screw Steel	137
Shank Steel	144
Shim, or Feather Steel	144
Shipments	20
Delivery	20
Express	20
Freight Allowance	20
Skate-Runner	144
Sledge Steel	144
Smokeless Powder Rifle-Barrel Steel	132
Soft Barrel Steel	136
Special-Service Alloy Tool-Steels	52–63
See also Tool-Steels	
Hardening of	53
Special Tool-Steel	35
Spindle Steel	137
Spring-Steels	126
Alloy	126
Chrome-Vanadium	126
Flexo	126
Presto	126
Victor	126
Carbon	126
Crucible	126
Special Open-Hearth	126
Classification	127
Spring-Steel, Cold-Rolled	171–176
Spring-Steel, Trap	144
Stamping Steel	171–176
Standard Tool-Steel	36
Star-Zenith High-Speed Tool-Steel	25–27
Working Instructions	28–29
Star-Zenith Tool-Holder Steel	30
Steel Castings, Chrome-Nickel	145
Steel Wire, Flat and Round	181

Page

Stentor, Unshrinkable 59
Straight-Carbon Spring-Steels—
See Spring-Steels
Straight-Carbon Tool-Steels—See Tool-Steels
Strip-Steel, Cold-Rolled 171–177
How to Order 172, 173
Price Lists 174–176
Weight of 231–233

Tables and Useful Information 209–239
Tape-Line, Cold-Rolled 181
Temperatures 236
Color Scale of 39
Temper-Colors 48–49
Tempering 17, 48–49
Die-Blocks 83
Straight-Carbon Tool-Steels 38–49
Terms 20
Thermometer Scale 235
Titan Tool-Steel 37
T-K Alloy-Steel 57
T-K Special Alloy-Steel 56
Toe-Calk Steel, (Hard Center) 144
Tool-Holder Steel 30
Tool-Steels:
Alloy:
Air-Hardening 32
Fast-Finishing 33
Star-Zenith 25–27
Zenith 25–27
Carbon:
Comet 37
Extra 36
Extra-Special 35
Special 35

Tool-Steels—Continued — Page

Carbon :—Continued

Standard 36

Titan 37

Special-Service Alloy:

Drawing-Die 63

J-Y 60

Jason 60

K-W Die 58

Keystone Hot-Header 59

Midas 61

Presto 61

Reading Chisel-Bit 63

" Double-Extra Wortle 63

" Double-Special 58

Roll-Turning 62

Stentor (Unshrinkable) 59

T-K 57

T-K Special 56

Veneer-Knife 62

Classification 64, 65

Hardening of 41–47, 53

How to Order 21

Photo-Micrographs of 43

Tempering 48, 49

Tool-Steel Drill-Rods 186–198

Tool-Steel Needle-Wire 183

Trap-Spring Steel 144

Trowel, Crucible 144

Trunnion-Balls 141

Truss-Spring Steel 171–176

Unshrinkable Steel; Stentor 59

Useful Information and Tables 209–239

Veneer-Knife Steel 62

Vise-Jaw Steel 136

Page

Warranty 21
Washer Steel 144
Wedge Steel 137
Weight of:
Bars 210–222
Bar Steel, Round, Square, etc., ... 210–215
Flat 217–222
Oval and Half-Oval 216
Discs 223
Drill Rods 187–198
Electrical Resistance Wire 185
Flat Wire 224–230
Rings 223
Rules for Finding 239
Strip Steel; Cold-Rolled 231–233
Well-Bit Steel 144
Wire-Die Steel 63
Wire Gauges 231–233
Wire Specialties 181–185
Wortle Steel 63

X-Y-Z Die-Blocks 82

Zenith High-Speed Tool-Steel 25–27
Working Instructions for 28, 29

Edward Stern & Company
Incorporated
Engravers and Printers
Philadelphia New York

Digitized by:

ASSOCIATION
FOR
PRESERVATION
TECHNOLOGY,
INTERNATIONAL
www.apti.org

BUILDING
TECHNOLOGY
HERITAGE
LIBRARY

https://archive.org/details/buildingtechnologyheritagelibrary

From the collection of:
Mike Jackson, FAIA